

Calculators are not allowed!

1. Find the derivative of  $y = x\sqrt{1-x^2}$ .      a)  $\frac{-x}{\sqrt{1-x^2}}$       b)  $\frac{x}{\sqrt{1-x^2}}$   
 c)  $\sqrt{1-x^2} - \frac{x^2}{\sqrt{1-x^2}}$       d)  $\sqrt{1-x^2} + \frac{x^2}{\sqrt{1-x^2}}$       e)  $\sqrt{1-x^2} + \frac{x^2}{2\sqrt{1-x^2}}$
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2. Evaluate  $\lim_{x \rightarrow -4} \frac{x^2 + x - 12}{x^2 + 7x + 12}$ .      a) DNE      b) 5      c) 6      d) 7      e) 8      f) 9      g)  $\frac{0}{0}$
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3. Evaluate  $\int \sin x - \csc^2 x \, dx$       a)  $-\cos x - \sec x + C$       b)  $-\cos x + \cot x + C$   
 c)  $\cos x - \cot x + C$       d)  $-\cos x + \csc x + C$       e)  $\cos x - \csc x + C$
- 
4. Evaluate  $\frac{d}{dx} \int_{2x}^{3x} \frac{1}{\ln t} \, dt$   
 a)  $\frac{3}{\ln 3x} - \frac{2}{\ln 2x}$       b)  $\frac{3x}{\ln 3x} - \frac{2x}{\ln 2x}$       c)  $\frac{3x}{\ln t} - \frac{2x}{\ln t}$       d)  $\frac{1}{3x} - \frac{1}{2x}$       e)  $\frac{1}{\ln 3x} - \frac{1}{\ln 2x}$
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5. Find the derivative of  $x^2y^2 + x^3 + y = 8$  at  $(2, 0)$ .  
 a) 0      b) -3      c) -6      d) -9      e) -12      f) -15
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6.  $f(x) = e^{2x}$ . Evaluate  $\lim_{h \rightarrow 0} \frac{f(0+h) - f(0)}{h}$ .      a)  $\frac{0}{0}$       b) DNE      c) 0      d) 1      e) 2      f) 3
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7. Find the  $x$  value of the point on the curve  $y = 3x + 2$  closest to the point  $(1, 0)$ .  
 a)  $-\frac{3}{2}$       b) -1      c)  $-\frac{1}{2}$       d) 0      e)  $\frac{1}{2}$       f) 1      g)  $\frac{3}{2}$
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8. An icicle in the shape of a cone is growing in volume at the rate of  $1 \text{ cm}^3/\text{min}$ . The height always equals twice the radius of the base. When the height equals 10 cm, how fast is the height increasing? (Hint:  $V = \frac{1}{3}\pi r^2 h$ .)  
 a)  $\frac{1}{25\pi}$       b)  $\frac{1}{75\pi}$       c)  $\frac{1}{225\pi}$       d)  $\frac{1}{315\pi}$       e)  $\frac{1}{400\pi}$
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9. Let  $y = xe^x$ . Where is  $y$  increasing?  
 a)  $x > 0$       b)  $x > -1$       c)  $x > 2$       d)  $x < -1$       e)  $x < 0$
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10. Find the derivative of  $y = \cot^{-2}(x)$ .

- a)  $2 \cot^{-3}(x) \csc^2(x)$     b)  $-2 \cot^{-3}(x) \csc^2(x)$     c)  $2 \cot^{-2}(x) \csc(x)$   
d)  $-2 \cot^{-2}(x) \csc(x)$     e)  $-\csc^{-4}(x)$
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11. Solve  $f'(x) = 3x^2 + e^x$  for  $f(x)$  when  $f(0) = 2$ .

- a)  $f(x) = x^3 + e^x + 1$     b)  $f(x) = x^3 + e^x + 2$     c)  $f(x) = 6x + e^x$     d)  $f(x) = x^3 + e^x$   
e)  $f(x) = 3x^2 + e^x + 2$
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12. Evaluate  $\int_1^2 3x^2 - 2x \, dx$ .    a) 4    b) 3    c) 2    d) 1    e) 0    f) -1

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13. Find the general antiderivative of  $3x^{1/2} + x^{-1/2}$ .

- a)  $3x^{3/2} - x^{1/2} + C$     b)  $2x^{3/2} + 2x^{1/2} + C$     c)  $2x^{3/2} - 2x^{1/2} + C$   
d)  $\frac{3}{2}x^{-1/2} + \frac{1}{2}x^{-3/2} + C$     e)  $\frac{9}{2}x^{3/2} - \frac{1}{2}x^{1/2} + C$
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14. Find the horizontal asymptote for  $y = \frac{1 + 7x^2 + 3x^3}{x^4 - x}$ .

- a)  $y = -1$     b)  $y = 0$     c)  $y = 1$     d)  $y = 2$     e)  $y = 3$
- 

15. Find the vertical asymptote(s) for  $y = \frac{1 + 7x^2 + 3x^3}{x^4 - x}$ .

- a)  $x = 0$     b)  $x = 0, x = 1$     c)  $x = -1, x = 0, x = 1$     d)  $x = -1, x = 1$     e)  $x = 1$
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16. Find the absolute maximum of the function  $f(x) = x^4 - 8x^2$  on the interval  $-1 \leq x \leq 3$ .

- a) -20    b) -16    c) -7    d) 0    e) 3    f) 9    g) 12
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17. Find the absolute minimum of the function  $f(x) = x^4 - 8x^2$  on the interval  $-1 \leq x \leq 3$ .

- a) -20    b) -16    c) -7    d) 0    e) 3    f) 9    g) 12
- 

18.  $f(x) = x^4 - 6x^2$  and  $f'(x) = 4x^3 - 12x$ . Where is  $f(x)$  concave up?

- a)  $x > 1$     b)  $x < -1, x > 1$     c)  $-1 < x < 1$   
d)  $-\sqrt{3} < x < 0, x > \sqrt{3}$     e)  $x < -\sqrt{3}, 0 < x < \sqrt{3}$
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19. Evaluate  $\lim_{x \rightarrow -4} \frac{x}{(4+x)^6}$ . a)  $\frac{1}{0}$  b)  $-\infty$  c)  $\infty$  d) DNE e) None of the above

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20. Evaluate  $\int \frac{2x^3}{\sqrt{x^4+9}} dx$ .

a)  $x^4\sqrt{x^4+9} + C$  b)  $\frac{1}{2}\sqrt{x^4+9} + C$  c)  $\frac{1}{\sqrt{x^4+9}} + C$

d)  $\frac{6x^2\sqrt{x^4+9} - 4x^6(x^4+9)^{-1/2}}{x^4+9} + C$  e)  $\sqrt{x^4+9} + C$

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21.  $y = \frac{x^3 + 3x}{x}$ . Find  $y''$ . a) 0 b) 1 c) 2 d) 3 e) 4 f) 5 g) 6

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22. Evaluate  $\lim_{x \rightarrow 1} \frac{\ln x - x + 1}{(x-1)^2}$ . a)  $-1/6$  b)  $-1/4$  c)  $-1/2$  d)  $1/2$  e)  $1/4$  f)  $1/6$

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23. Find the derivative of  $y = \text{Arctan}(x^2)$ .

a)  $\frac{2x}{1+x^2}$  b)  $\frac{2x}{1+x^4}$  c)  $-\tan^{-2}(x^2)\sec^2(x^2)2x$  d)  $\frac{1}{1+x^4}$  e)  $\tan^{-2}(x^2)\sec^2(x^2)2x$

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24. Evaluate  $\int_0^{1/2} \frac{1}{\sqrt{1-x^2}} dx$ . a) 0 b)  $\frac{\pi}{6}$  c)  $\frac{\pi}{4}$  d)  $\frac{\pi}{3}$  e)  $\frac{\pi}{2}$

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25. Find the derivative of  $y = \frac{\ln^2 x}{x}$ .

a)  $\frac{2\ln x - \ln^2 x}{x^2}$  b)  $\frac{2x\ln x - \ln^2 x}{x^2}$  c)  $\frac{2\ln x}{x}$  d)  $\frac{2 - 2\ln x}{x^2}$  e)  $\frac{\frac{1}{x} - \ln^2 x}{x^2}$

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26. Evaluate  $\int \frac{9x^4 + 5x^2}{x^{1/2}} dx$ .

a)  $\frac{\frac{9x^5}{5} + \frac{5x^3}{3}}{\frac{2x^{3/2}}{3}} + C$  b)  $2x^{9/2} + 2x^{5/2} + C$  c)  $9x^{7/2} + 5x^{3/2} + C$

d)  $\frac{x^{1/2}(36x^3 + 10x) - (9x^4 + 5x^2)\frac{1}{2}x^{1/2}}{x}$  e)  $\frac{81}{2}x^{9/2} + \frac{25}{2}x^{5/2} + C$

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27. Evaluate  $\int \frac{3x^2}{\sqrt{1-x^6}} dx$ .

a)  $2\sqrt{1-x^6} + C$  b)  $3x^2\text{Arcsin}(x^3) + C$  c)  $\text{Arcsin}(x^3) + C$

d)  $\frac{6x\sqrt{1-x^6} + 9x^7(1-x^6)^{-1/2}}{1-x^6}$  e)  $\ln|\sqrt{1-x^6}| + C$

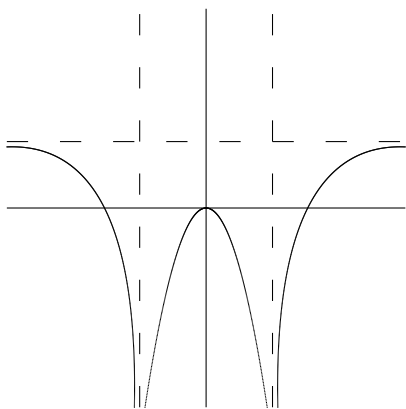
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28. Evaluate  $\lim_{x \rightarrow 1} \frac{\frac{1}{3-x} - \frac{1}{x+1}}{x-1}$ . a) DNE b)  $-\frac{1}{4}$  c)  $\frac{1}{4}$  d)  $-\frac{1}{3}$  e)  $\frac{1}{3}$  f)  $-\frac{1}{2}$  g)  $\frac{1}{2}$

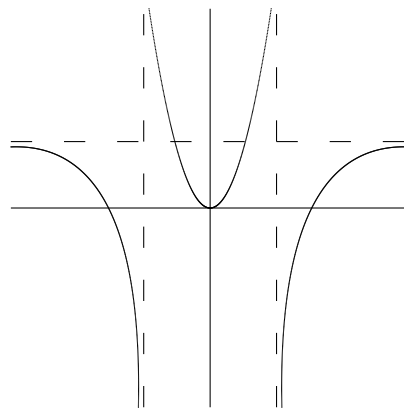
29. Evaluate  $\lim_{x \rightarrow 3} \frac{3 - \sqrt{12-x}}{3-x}$  a)  $\frac{0}{0}$  b) DNE c)  $\frac{1}{6}$  d) 0 e)  $-\frac{1}{6}$  f)  $\frac{1}{2}$  g)  $-\frac{1}{2}$

30. Which of the following graphs most closely has the following properties:

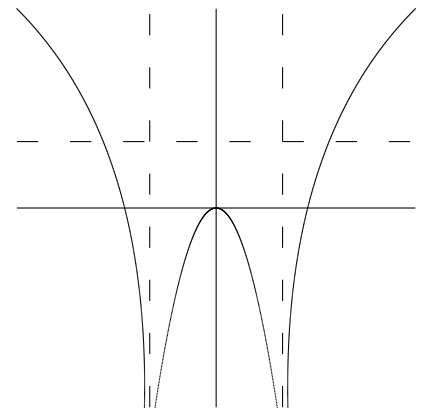
- Increasing  $-1 < x < 0$ ,  $0 < x < 1$ ,  $x > 1$     Decreasing  $x < -1$ .
- Concave down  $x < -1$ ,  $-1 < x < 0$ ,  $x > 1$ ,    Concave up  $0 < x < 1$ .
- Vertical Asymptotes  $x = -1$ ,  $x = 1$ . Horizontal Asymptote  $y = 1$ .
- $f(0) = 0$ .



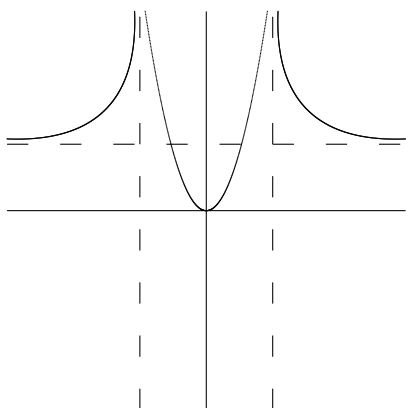
a)



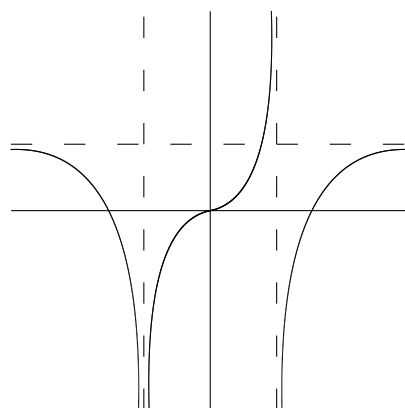
b)



c)



d)



e)

### Answers

1. c    2. d    3. b    4. a    5. e    6. e    7. c    8. a    9. b    10. a  
 11. a    12. a    13. b    14. b    15. b    16. f    17. b    18. b    19. b    20. e  
 21. c    22. c    23. b    24. b    25. a    26. b    27. c    28. g    29. e    30. e

# MATH 1610 PRACTICE FINAL EXAM 2

Calculators are not allowed!

1. Find the derivative of  $y = \sin x(1 + \cos x)^4$ .

- a)  $\cos x(1 + \cos x)^4 - 4 \sin^2 x(1 + \cos x)^3$     b)  $\sin x - 4 \cos^3 x \sin x$     c)  $4 \cos x(1 + \cos x)^3$   
d)  $4 \sin x(1 + \cos x)^3 + \cos x(1 + \cos x)^4$     e)  $-\cos x(1 + \cos x)^4 + 4 \sin x(1 + \cos x)^3$
- 

2. Evaluate  $\lim_{x \rightarrow 2} \frac{4 - x^2}{x^2 - 3x + 2}$ .    a) DNE    b)  $-6$     c)  $-4$     d)  $-1$     e)  $1$     f)  $2$     g)  $\frac{0}{0}$

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3. Evaluate  $\int \sec x \tan x - \cos x \, dx$     a)  $\sec^2 x + \sin x + C$     b)  $\sec x + \sin x + C$   
c)  $\sec x - \sin x + C$     d)  $\tan^2 x - \sin x + C$     e)  $\tan x - \sin x + C$

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4. Evaluate  $\frac{d}{dx} \int_0^{\sin x} \frac{1}{\sqrt{1-t^2}} \, dt$  for  $0 \leq x \leq \frac{\pi}{2}$ .  
a)  $\frac{1}{\sqrt{1-x^2}}$     b)  $\frac{1}{\sqrt{1-\sin^2 x}}$     c)  $\tan x$     d)  $\cot x$     e)  $1$

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5. Find the derivative,  $\frac{dy}{dx}$  or  $y'$ , of  $\frac{y+4}{x-2} = 5y$  at  $(3, 1)$ .  
a)  $\frac{4}{5}$     b)  $\frac{5}{4}$     c)  $-\frac{4}{5}$     d)  $-\frac{5}{4}$     e)  $5$     f)  $-5$

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6.  $f(x) = x^2 + 1$ . Evaluate  $\lim_{h \rightarrow 0} \frac{f(h) - f(0)}{h}$ .    a)  $\frac{0}{0}$     b) DNE    c)  $0$     d)  $1$     e)  $2$     f)  $3$

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7. A farmer has 120 ft of fencing to enclose three adjacent rectangular pens. Find the maximum total area.

- a) 30    b) 120    c) 300    d) 450    e) 600    f) 900
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8. A snowball melts so that its surface area decreases at a rate of  $40\pi \text{ cm}^2/\text{min}$ . Find the rate of change of the diameter when the diameter is 10 cm. (Hint:  $S = 4\pi r^2$ .)

- a)  $-2$     b)  $-1$     c)  $0$     d)  $1$     e)  $2$
- 

9. Let  $y = 2x^3 - 18x$ . Where is  $y$  increasing?

- a)  $-\sqrt{3} < x < \sqrt{3}$     b)  $x < -3$     c)  $x < -\sqrt{3}, x > \sqrt{3}$     d)  $-3 < x < 3$     e)  $x > 3$
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10. Find the derivative of  $y = \sin^{-4}(x)$ .  
a)  $4 \sin^{-5}(x) \cos(x)$     b)  $-4 \sin^{-3}(x) \cos(x)$     c)  $-4 \sin^{-5}(x) \cos(x)$     d)  $-4 \cos(x)$
- 

11. Solve  $f'(x) = 2 \cos(t) + \sec^2(t)$ ,  $-\pi/2 < t < \pi/2$  for  $f(t)$  when  $f(\pi/3) = 4$ .  
a)  $f(x) = 2 \sin(t) + \tan(t) + 4 + 2\sqrt{3}$     b)  $f(x) = 2 \sin(t) + \tan(t) - 4 - 2\sqrt{3}$   
c)  $f(x) = 2 \sin(t) + \tan(t) - 4 + 2\sqrt{3}$     d)  $f(x) = 2 \sin(t) - \tan(t) - 4 + 2\sqrt{3}$   
e)  $f(x) = 2 \sin(t) + \tan(t) + 4 - 2\sqrt{3}$
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12. Evaluate  $\int_{-1}^2 3x^2 - 1 \, dx$ .    a)  $-6$     b)  $-3$     c)  $0$     d)  $3$     e)  $6$     f)  $8$
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13. Find the general antiderivative of  $3x^{2/7} + x^{-1/4}$ .  
a)  $3x^{-5/7} + x^{-5/4} + C$     b)  $\frac{7}{3}x^{9/7} + \frac{4}{3}x^{3/4} + C$     c)  $\frac{6}{7}x^{9/7} - \frac{1}{4}x^{3/4} + C$   
d)  $\frac{6}{7}x^{-5/7} - \frac{1}{4}x^{-5/4} + C$     e)  $\frac{7}{3}x^{-5/7} - \frac{4}{3}x^{-5/4} + C$
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14. Find the horizontal asymptote for  $y = \frac{6 - 5x + x^2}{x^3 - 1}$ .  
a)  $y = 6$     b)  $y = 1$     c)  $y = 0$     d)  $y = -6$     e)  $y = 2, y = 3$
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15. Find the vertical asymptote(s) for  $y = \frac{6 - 5x + x^2}{x^3 - 1}$ .  
a)  $x = 1$     b)  $x = 2, x = 3$     c)  $x = 0$     d)  $x = 6$     e)  $x = -1$
- 

16. Find the absolute maximum of the function  $f(x) = x^3 - 12x$  on the interval  $0 \leq x \leq 4$ .  
a)  $0$     b)  $16$     c)  $8$     d)  $2$     e)  $-2$     f)  $9$     g)  $12$
- 

17. Find the absolute minimum of the function  $f(x) = x^3 - 12x$  on the interval  $0 \leq x \leq 4$ .  
a)  $-20$     b)  $-16$     c)  $-8$     d)  $0$     e)  $3$     f)  $9$     g)  $12$
- 

18.  $f(x) = e^x - \frac{1}{2}x^2$  and  $f'(x) = e^x - x$ . Where is  $f(x)$  concave up?  
a)  $x > 1$     b)  $x < 1$     c) nowhere    d)  $x < 0$     e)  $x > 0$
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19. Evaluate  $\lim_{x \rightarrow -2} \frac{x}{(x+2)^4}$ . a)  $\frac{-2}{0}$  b)  $-\infty$  c)  $\infty$  d) DNE e) None of the above

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20. Evaluate  $\int \frac{2x+2}{\sqrt{x^2+2x}} dx$ . a)  $(x^4+9)^{\frac{3}{2}} + C$  b)  $2\sqrt{x^2+2x} + C$  c)  $\frac{1}{\sqrt{x^2+2x}} + C$   
d)  $\frac{2\sqrt{x^2+2x} - (2x^2+4x+2)(x^2+2x)^{-1/2}}{x^2+2x} + C$  e)  $\sqrt{x^2+2x} + C$

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21.  $y = \frac{-3}{x-3}$ . Find  $y''$  at  $x = 2$ . a)  $-6$  b)  $-3$  c)  $3$  d)  $6$  e)  $-1$  f)  $2$  g)  $-2$

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22. Evaluate  $\lim_{x \rightarrow 0} \frac{4x^2}{\cos(2x) - 1}$ . a)  $2$  b)  $-2$  c)  $4$  d)  $-4$  e)  $8$  f)  $-8$

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23. Find the derivative of  $y = \text{Arcsin}(1-x)$ .

a)  $\frac{-1}{\sqrt{x-1}}$  b)  $\frac{1}{\sqrt{x(2-x)}}$  c)  $-\cos(1-x)$  d)  $\frac{-1}{\sqrt{x(2-x)}}$  e)  $\frac{1}{\sqrt{x-1}} \frac{-1}{\sqrt{x-1}}$

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24. Evaluate  $\int_0^1 \frac{1}{1+x^2} dx$ . a)  $0$  b)  $-\frac{\pi}{2}$  c)  $\frac{\pi}{2}$  d)  $-\frac{\pi}{4}$  e)  $\frac{\pi}{4}$

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25. Find the derivative of  $y = 2e^x \ln x$  at  $x = 1$ .

a)  $0$  b)  $1$  c)  $e$  d)  $2e$  e)  $3e$

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26. Evaluate  $\int \frac{5x^2+3x}{x^{1/2}} dx$ .

a)  $\frac{\frac{5x^3}{3} + \frac{3x^2}{2}}{\frac{2x^{3/2}}{3}} + C$  b)  $2x^{5/2} + 2x^{3/2} + C$  c)  $5x^{5/2} + 3x^{3/2} + C$

d)  $\frac{x^{1/2}(25x^3+10x) - (5x^3+3x^2)\frac{1}{2}x^{1/2}}{x}$  e)  $\frac{25}{2}x^{5/2} + \frac{9}{2}x^{3/2} + C$

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27. Evaluate  $\int \frac{x^2}{1+x^6} dx$ .

a)  $\frac{x^3}{3} \text{Arctan}(1+x^3) + C$  b)  $x^2 \text{Arctan}(x^3) + C$  c)  $\frac{1}{3} \text{Arctan}(x^3) + C$  d)  $\frac{(1+x^6)(2x) - (x^2)(6x^5)}{(1+x^6)^2}$   
e)  $\frac{1}{3} \ln|1+x^3| + C$

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28. Evaluate  $\lim_{x \rightarrow 1} \frac{\frac{1}{3x+2} - \frac{1}{6-x}}{x-1}$ . a) DNE b)  $\frac{0}{0}$  c)  $\frac{1}{25}$  d)  $-\frac{1}{25}$  e)  $-\frac{4}{25}$  f)  $\frac{4}{25}$

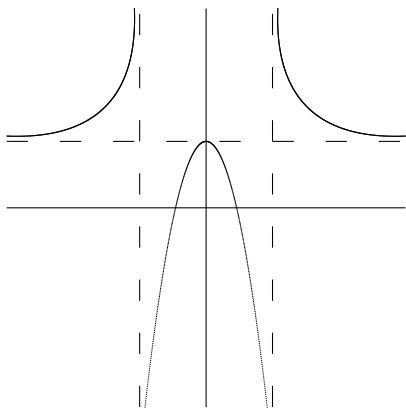
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29. Evaluate  $\lim_{x \rightarrow 2} \frac{\sqrt{4x^2 + 9} - 5}{x - 2}$     a)  $\frac{0}{0}$     b) DNE    c)  $-\frac{5}{6}$     d)  $-\frac{5}{6}$     e)  $-\frac{8}{5}$     f)  $\frac{8}{5}$

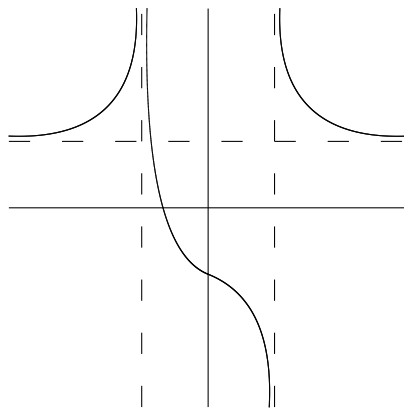
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30. Which of the following graphs most closely has the following properties:

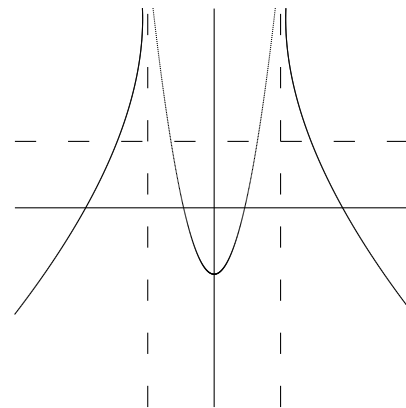
- Decreasing  $-1 < x < 0$ ,  $x > 1$ ,    Increasing  $x < -1$ ,  $0 < x < 1$ .
- Concave up  $x < -1$ ,  $-1 < x < 1$ ,  $x > 1$ .
- Vertical Asymptotes  $x = -1$ ,  $x = 1$ . Horizontal Asymptote  $y = 1$ .
- $f(0) = -1$ .



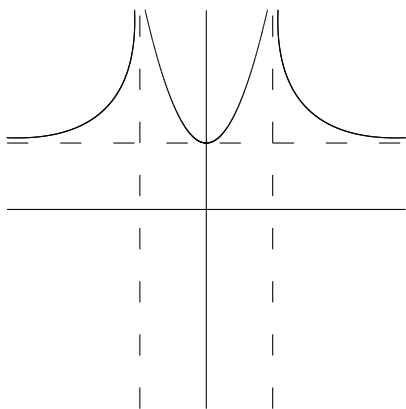
a)



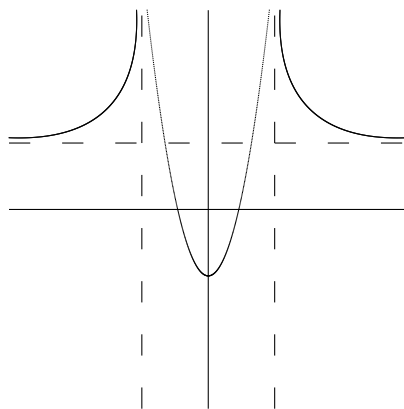
b)



c)



d)



e)

### Answers

1. a    2. c    3. c    4. e    5. d    6. c    7. d    8. a    9. c    10. c  
 11. e    12. e    13. b    14. c    15. a    16. b    17. b    18. e    19. b    20. b  
 21. d    22. b    23. d    24. e    25. d    26. b    27. c    28. e    29. f    30. e

**MATH 1610****PRACTICE FINAL EXAM 3****Calculators are not allowed!**

1. Find the derivative of  $y = x^2(x^3 + 1)^4$ .      a)  $24x^3(x^3 + 1)^3$       b)  $2x(x^3 + 1)^4 + 4x^2(x^3 + 1)^3$   
c)  $8x(x^3 + 1)^3$       d)  $2x(x^3 + 1)^4 + 12x^4(x^3 + 1)^3$       e)  $2x(x^3 + 1)^4 + x^2(3x^2)^4$
- 

2. Evaluate  $\lim_{x \rightarrow 2^+} \frac{x^2 + x - 6}{x^2 - 6x + 8}$ .      a)  $-\frac{5}{2}$       b)  $-\frac{5}{6}$       c)  $\frac{1}{4}$       d)  $\frac{3}{4}$       e) 1      f)  $\frac{0}{0}$       g) DNE
- 

3. Evaluate  $\int \sec x \tan x + \sin x \, dx$       a)  $\sec^2 x + \cos x + C$       b)  $\sec x - \cos x + C$   
c)  $\sec x + \cos x + C$       d)  $\tan x - \cos x + C$       e)  $\csc x \cot x + \cos x + C$
- 

4. Evaluate  $\frac{d}{dx} \int_{3x}^0 \cos t \, dt$   
a)  $3 \cos 3x$       b)  $3x \cos 3x$       c)  $-3 \cos 3x$       d)  $3 \sin 3x$       e)  $-\sin 3x$
- 

5. Find the derivative,  $\frac{dy}{dx}$  or  $y'$ , of  $x^3 - \sqrt{y} = \frac{1}{2}y^2 + 6$  at  $(2, 1)$ .  
a) 4      b) 6      c) 8      d) 10      e) 12      f) 14
- 

6.  $g(u) = \sin 2u$ . Evaluate  $\lim_{h \rightarrow 0} \frac{g(\frac{\pi}{4} + h) - g(\frac{\pi}{4})}{h}$ .      a)  $\frac{0}{0}$       b) DNE      c) 0      d) 1      e) 2      f) 3
- 

7. A rectangle has its base on the x-axis and the other two vertices below the x-axis and lying on the parabola  $y = 2x^2 - 24$ . Find the maximum area of the rectangle.  
a) 2      b) 4      c) 16      d) 32      e) 64      f) 128
- 

8. A 10 m ladder is leaning against a house and begins to slide. How fast is the top of the ladder sliding down the house at the instant of time when the bottom of the ladder is 8 m from the house and sliding away from the house at a rate of 3 m/s?  
a) 1      b) 2      c) 3      d) 4      e) 5
- 

9. Let  $y = x \ln x$ . Where is  $y$  increasing?  
a)  $x < e^{-1}$       b)  $x > -1$       c)  $x > e$       d)  $x > e^{-1}$       e)  $x < -1$
- 

10. Find the derivative of  $y = \cos^2(2x)$ .      a)  $-4 \cos(2x) \sin(x)$   
b)  $4 \cos(x) \sin(x)$       c)  $4 \cos(2x)$       d)  $-4 \cos(2x) \sin(2x)$       e)  $4 \cos(2x) \sin(2x)$
-

11. Solve  $f'(x) = \frac{2}{x}$ ,  $x > 0$  for  $f(x)$  when  $f(1) = 7$ .
- a)  $f(x) = 2 \ln(x) + 7$     b)  $f(x) = 2 \ln(-x) - 7$     c)  $f(x) = 2 \ln(-x) + 7$   
d)  $f(x) = 2 \ln(x) - 7$     e)  $f(x) = -2 \ln(-x) - 7$
- 

12. Evaluate  $\int_{-1}^1 12x^3 + 3x^2 dx$ .    a)  $-2$     b)  $-1$     c)  $0$     d)  $1$     e)  $2$
- 

13. Find the general antiderivative of  $5x^{1/5} - 3x^{-1/2}$ .
- a)  $x^{1/6} - x^{1/3} + C$     b)  $5x^{6/5} - 3x^{1/3} + C$     c)  $x^{-4/5} + \frac{3}{2}x^{-3/2} + C$   
d)  $\frac{25}{6}x^{6/5} - 6x^{1/2} + C$     e)  $x^{6/5} + \frac{3}{2}x^{3/2} + C$
- 

14. Find the horizontal asymptote for  $y = \frac{3-x}{x^4-4x^2}$ .
- a)  $y = 3$     b)  $y = -1$     c)  $y = 2$     d)  $y = 0$     e)  $y = 4$
- 

15. Find the vertical asymptote(s) for  $y = \frac{3-x}{x^4-4x^2}$ .
- a)  $x = -1$     b)  $x = 3$     c)  $x = 0, x = 2, x = -2$     d)  $x = 3, x = 4$     e)  $x = -3$
- 

16. Find the absolute maximum of the function  $f(x) = \sin x$  on the interval  $\left[\frac{\pi}{4}, \pi\right]$ .
- a)  $0$     b)  $2$     c)  $\frac{\sqrt{3}}{2}$     d)  $1$     e)  $-1$     f)  $\frac{\sqrt{2}}{2}$     g)  $-2$
- 

17. Find the absolute minimum of the function  $f(x) = \sin x$  on the interval  $\left[\frac{\pi}{4}, \pi\right]$ .
- a)  $0$     b)  $2$     c)  $-\frac{\sqrt{3}}{2}$     d)  $1$     e)  $-1$     f)  $-\frac{\sqrt{2}}{2}$     g)  $-2$
- 

18.  $f(x) = 10x^5 - 3x^3$  and  $f'(x) = 50x^4 - 9x^2$ . Where is  $f(x)$  concave down?
- a)  $x < -3/10, 0 < x < 3/10$     b)  $x < -3/10$     c)  $-3/10 < x < 3/10$   
d)  $0 < x < 3/10, x < -3/10$     e)  $x > 3/10$
- 

19. Evaluate  $\lim_{x \rightarrow 4} \frac{1}{(x-4)^3}$ .    a)  $\frac{1}{0}$     b)  $-\infty$     c)  $\infty$     d) DNE    e) None of the above
-

20. Evaluate  $\int \sin(x)e^{\cos(x)} dx$ . a)  $-e^{\cos(x)} + C$  b)  $e^{\cos(x)} + C$  c)  $-\cos(x)e^{\cos(x)} + C$   
d)  $\cos(x)e^{\cos(x)} + C$  e)  $\cos(x)e^{\cos(x)} + \sin(x)e^{\cos(x)} + C$
- 

21.  $y = \frac{x^2 - 1}{x}$ . Find  $y''$  at  $x = -1$ . a) 2 b) -2 c) 0 d) 1 e) -1 f) 1/2
- 

22. Evaluate  $\lim_{x \rightarrow 0} \frac{2x^2}{\ln(\sec(x))}$ . a)  $\infty$  b)  $-\infty$  c) 0 d) -4 e) 2 f) 4
- 

23. Find the derivative of  $y = \text{Arctan}\left(\frac{x}{2}\right)$ .  
a)  $\frac{1}{1 + \frac{x^2}{4}}$  b)  $\frac{1}{1 + \frac{x}{2}}$  c)  $\frac{1}{2 + \frac{x^2}{2}}$  d)  $\frac{-1}{1 + \frac{x}{2}}$  e)  $\frac{1}{2} \sec^2\left(\frac{x}{2}\right)$
- 

24. Evaluate  $\int_{-1}^1 \frac{1}{\sqrt{1-x^2}} dx$ . a) 0 b)  $-\frac{\pi}{2}$  c)  $\frac{\pi}{2}$  d)  $-\pi$  e)  $\pi$
- 

25. Find the derivative of  $y = x \ln x - x^2$ .  
a)  $\frac{1}{x} - 2x$  b)  $\ln x$  c)  $1 + \ln x - 2x$  d)  $x \ln x - 2x$  e) 0
- 

26. Evaluate  $\int \frac{2-x^2}{x^2} dx$ .  
a)  $\frac{2x - \frac{x^3}{3}}{\frac{x^3}{3}} + C$  b)  $-2x + 2x^2 + C$  c)  $\frac{-2}{x} - x + C$   
d)  $\frac{1}{x} - \frac{1}{x^2} + C$  e)  $\frac{2x - x^3}{4} + C$
- 

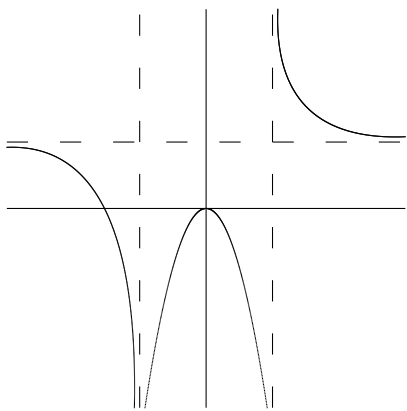
27. Evaluate  $\int \frac{1}{(\sqrt[3]{x^2})(\sqrt{1-x^{2/3}})} dx$ .  
a)  $3\text{Arcsin}(x^{1/3}) + C$  b)  $3\ln|\sqrt{1-x^{2/3}}|(x^{1/3}) + C$  c)  $3x^{1/3}\text{Arcsin}(x^{1/3}) + C$   
d)  $\ln|1-x^{2/3}| + C$  e)  $\text{Arcsin}|1-x^{2/3}| + C$
- 

28. Evaluate  $\lim_{x \rightarrow 0} \frac{\frac{1}{2x+1} + \frac{1}{x-1}}{x}$ . a) DNE b)  $\frac{0}{0}$  c) -3 d) -2 e) -1 f) 0 g) 1
- 

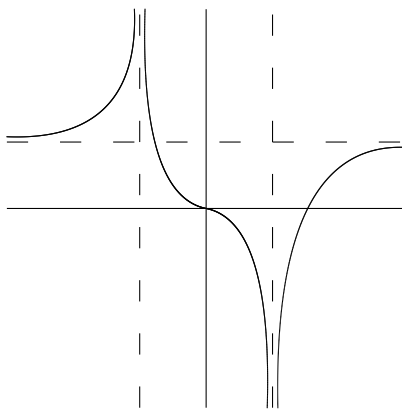
29. Evaluate  $\lim_{x \rightarrow 5} \frac{4 - \sqrt{4x-4}}{2x-10}$  a)  $\frac{0}{0}$  b) DNE c)  $\frac{1}{2}$  d)  $\frac{1}{4}$  e)  $-\frac{1}{4}$  f)  $-\frac{1}{2}$  g) 1
-

30. Which of the following graphs most closely has the following properties:

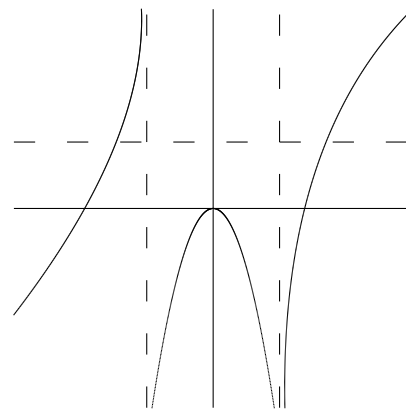
- Increasing  $x < -1$ ,  $-1 < x < 0$ ,  $0 < x < 1$ ,  $x > 1$ .
- Concave up  $x < -1$ ,  $0 < x < 1$ , Concave down  $-1 < x < 0$ ,  $x > 1$ .
- Vertical Asymptotes  $x = -1$ ,  $x = 1$ . Horizontal Asymptote  $y = 1$ .
- $f(0) = 0$ .



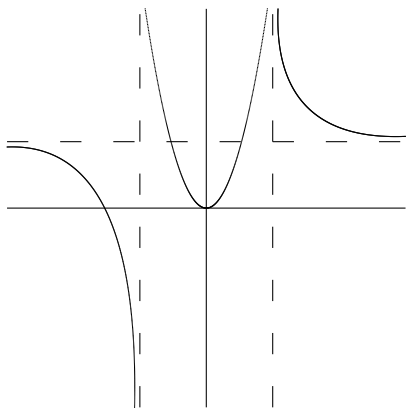
a)



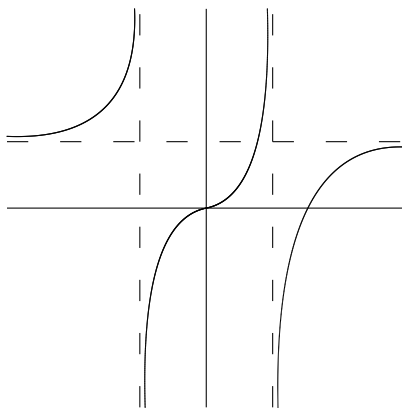
b)



c)



d)



e)

### Answers

1. d 2. a 3. b 4. c 5. c 6. c 7. e 8. d 9. d 10. d  
 11. a 12. e 13. d 14. d 15. c 16. d 17. a 18. a 19. d 20. a  
 21. a 22. f 23. c 24. e 25. c 26. c 27. a 28. c 29. e 30. e

# MATH 1610 PRACTICE FINAL EXAM 4

Calculators are not allowed!

1. Find the derivative of  $y = x^3 \ln x$ .      a)  $3x^2 \ln x + x^2$       b)  $3x^2 + x^3 \ln x$   
c)  $3x$       d)  $3x^2$       e)  $x^3 \ln x + 3x^2 \ln x$       f)  $\ln x^3 + 3x^2$
- 

2. Evaluate  $\lim_{x \rightarrow -1} \frac{x^2 - 4x - 5}{x^2 - x - 2}$ .      a) 1      b) 2      c) 3      d) 4      e) 5      f)  $\frac{0}{0}$       g) DNE
- 

3. Evaluate  $\int \sin x - \csc x \cot x \, dx$       a)  $\cos x - \csc x + C$       b)  $\cos^2 x + \csc^2 x + C$   
c)  $-\cos x + \sec x \tan x + C$       d)  $\sin^2 x - \csc^2 x + C$       e)  $-\cos x + \csc x + C$
- 

4. Evaluate  $\frac{d}{dx} \int_1^{e^x} \ln t \, dt$   
a)  $x - 1$       b)  $xe^x - 1$       c)  $e^x - \ln x$       d)  $xe^x$       e)  $e^{2x}$
- 

5. Find the derivative,  $\frac{dy}{dx}$  or  $y'$ , of  $2x^2y - y = x + 5$  at  $(2, 1)$ .  
a)  $-2$       b)  $-1$       c)  $0$       d)  $1$       e)  $2$       f)  $3$
- 

6.  $f(x) = \frac{2}{x}$ . Evaluate  $\lim_{h \rightarrow 0} \frac{f(\sqrt{2} + h) - f(\sqrt{2})}{h}$ .      a)  $\frac{0}{0}$       b) DNE      c)  $0$       d)  $1$       e)  $-1$       f)  $2$
- 

7. A rectangular poster is to have 1 inch margins on each side and 2 inch margins on top and bottom. If the poster must have a printed area of 8 square inches, what is the smallest possible total area?  
a) 8      b) 10      c) 14      d) 16      e) 32      f) 256
- 

8. The volume of a cube is increasing at a rate of  $10 \text{ m}^3/\text{sec}$ . How fast is the surface area increasing when the length of an edge is 4 m?  
a) 6      b) 10      c) 14      d) 18      e) 22
- 

9. Let  $y = x^4 - 2x^2$ . Where is  $y$  increasing?  
a)  $-1 < x < 0, x > 1$       b)  $x < -1$       c)  $0 < x < 1, x < -1$       d)  $x > 1$       e)  $-1 < x < 1$
- 

10. Find the derivative of  $y = \csc^{-3}(4x)$ .      a)  $-12 \csc^{-3}(4x) \cot(4x)$       b)  $12 \csc^{-3}(4x)$   
c)  $12 \csc^{-3}(x) \cot(x)$       d)  $-12 \csc^{-3}(x) \cot(x)$       e)  $12 \csc^{-3}(4x) \cot(4x)$
-

11. Solve  $f'(x) = 8x^3 + 12x + 3$  for  $f(x)$  when  $f(1) = 6$ .  
a)  $f(x) = 2x^4 + 6x^2 + 3x - 5$     b)  $f(x) = 2x^4 + 6x^2 + 3x - 4$     c)  $f(x) = 2x^4 + 6x^2 + 3x - 3$   
d)  $f(x) = 2x^4 + 6x^2 + 3x - 2$     e)  $f(x) = 2x^4 + 6x^2 + 3x - 1$
- 

12. Evaluate  $\int_1^2 4x^3 - 8x \, dx$ .    a) 1    b) 2    c) 3    d) 4    e) 5    f) 6
- 

13. Find the general antiderivative of  $4x^{5/2} - 2x^{1/3}$ .  
a)  $\frac{8}{7}x^{7/2} - \frac{3}{2}x^{4/3} + C$     b)  $10x^{7/2} - \frac{2}{3}x^{1/3} + C$     c)  $\frac{8}{7}x^{7/2} - \frac{2}{3}x^{-2/3} + C$   
d)  $4x^{7/2} - 2x^{4/3} + C$     e)  $10x^{3/2} - \frac{2}{3}x^{-2/3} + C$
- 

14. Find the horizontal asymptote for  $y = \frac{1 + 2x - 3x^2}{x^2 + 6x + 9}$ .  
a)  $y = -3$     b)  $y = 3$     c)  $y = 0$     d)  $y = 1$     e)  $y = -\frac{1}{3}, y = 1$
- 

15. Find the vertical asymptote(s) for  $y = \frac{1 + 2x - 3x^2}{x^2 + 6x + 9}$ .  
a)  $x = 1$     b)  $x = 3$     c)  $x = -3$     d)  $x = 0$     e)  $x = -3, x = 3$
- 

16. Find the absolute maximum of the function  $f(x) = x^3 - \frac{3}{2}x^2$  on the interval  $-1 \leq x \leq 2$ .  
a) -1    b) 0    c) 1    d) 2    e) 3    f) 4    g) 5
- 

17. Find the absolute minimum of the function  $f(x) = x^3 - \frac{3}{2}x^2$  on the interval  $-1 \leq x \leq 2$ .  
a) -1    b)  $-\frac{1}{2}$     c) 0    d)  $-\frac{5}{2}$     e)  $-\frac{3}{2}$     f)  $\frac{1}{2}$     g) 1
- 

18.  $f(x) = 5x^3 + 45x^2 - 14$  and  $f'(x) = 15x^2 + 90x$ . Where is  $f(x)$  concave down?  
a)  $x > -3$     b)  $x < -3$     c)  $-6 < x < 0$   
d)  $x < -6, x > 0$     e)  $x < 0$
- 

19. Evaluate  $\lim_{x \rightarrow -3^+} \frac{x}{(x+3)^5}$ .    a)  $-\frac{3}{0}$     b)  $-\infty$     c)  $\infty$     d) DNE    e) None of the above
-

20. Evaluate  $\int \frac{\sec^2(\ln(x))}{x} dx$ . a)  $\ln(x) \tan(\ln(x)) + C$  b)  $\sec^2(\ln(x)) + C$  c)  $\ln(x) \sec^2(\ln(x)) + C$   
d)  $\sec(\ln(x)) \tan(\ln(x)) + C$  e)  $\tan(\ln(x)) + C$
- 

21.  $y = \frac{x^2 + 1}{x - 1}$ . Find  $y''$  at  $x = 2$ . a) 5 b) -5 c) 4 d) -4 e) 1 f) -1 g) 0
- 

22. Evaluate  $\lim_{x \rightarrow 0^+} \frac{\ln(x^5)}{\ln(x^2)}$ . a)  $\infty$  b)  $-\infty$  c)  $-5/2$  d)  $5/2$  e) 0 f) 1
- 

23. Find the derivative of  $y = \text{Arccsc}(x^2)$ .

- a)  $\frac{2}{x\sqrt{x^4 - 1}}$  b)  $\frac{1}{x^2\sqrt{x^2 - 1}}$  c)  $\frac{-1}{x^2\sqrt{x^2 - 1}}$  d)  $\frac{-2}{x\sqrt{x^4 - 1}}$  e)  $\frac{-2}{x^2\sqrt{x^4 - 1}}$
- 

24. Evaluate  $\int_1^2 \frac{1}{x\sqrt{x^2 - 1}} dx$ . a) 0 b)  $-\frac{\pi}{3}$  c)  $\frac{\pi}{3}$  d)  $-\frac{\pi}{4}$  e)  $\frac{\pi}{4}$
- 

25. Find the derivative of  $y = \frac{x^2}{\ln x}$  at  $x = e$ .

- a) 0 b)  $e$  c)  $2e$  d)  $3e$  e)  $4e$
- 

26. Evaluate  $\int \frac{9x^4 + 7x^3}{x^{1/2}} dx$ .

- a)  $\frac{9x^5}{5} + \frac{7x^2}{7} + C$  b)  $2x^{9/2} + 2x^{7/2} + C$  c)  $9x^{7/2} + 7x^{1/2} + C$   
d)  $\frac{x^{1/2}(36x^3 + 10x) - (9x^4 + 7x^2)\frac{1}{2}x^{1/2}}{x}$  e)  $\frac{81}{2}x^{9/2} + \frac{7}{2}x^{7/2} + C$
- 

27. Evaluate  $\int \frac{4x}{(1 + x^2)^3} dx$ .

- a)  $2x^2 \text{Arctan}(x) + C$  b)  $4\ln|1 + x^2| + C$  c)  $\frac{-1}{(1 + x^2)^2} + C$   
d)  $\frac{(1 + x^2)^3(4) - (4x)(3(1 + x^2)^2(2x))}{(1 + x^2)^6} + C$  e)  $2x\ln|x^2| + C$
- 

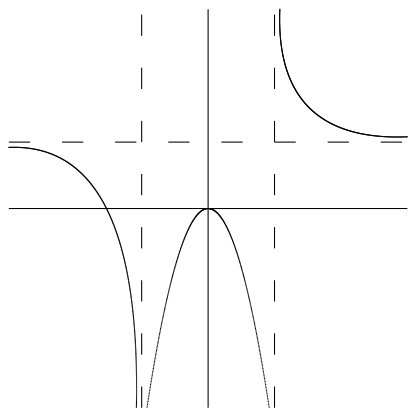
28. Evaluate  $\lim_{x \rightarrow 0} \frac{\frac{1}{x-1} - \frac{1}{2x-1}}{x^2 - x}$ . a) DNE b)  $\frac{0}{0}$  c) -2 d) -1 e) 0 f) 1 g) 2
-

29. Evaluate  $\lim_{x \rightarrow 1} \frac{\sqrt{5x-1}-2}{2x-2}$     a)  $\frac{0}{0}$     b) DNE    c)  $\frac{1}{2}$     d)  $\frac{5}{8}$     e)  $-\frac{5}{8}$     f)  $-\frac{1}{2}$     g)  $\frac{1}{4}$

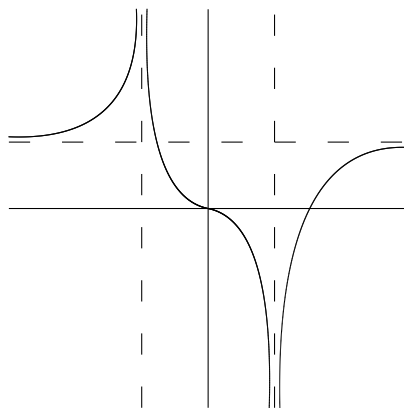
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30. Which of the following graphs most closely has the following properties:

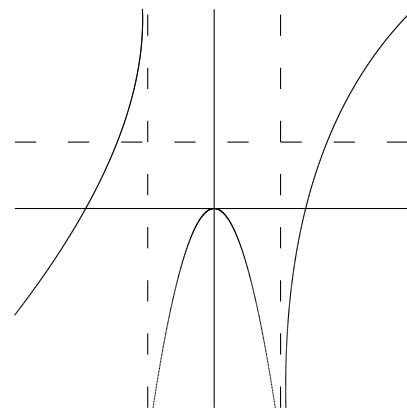
- Decreasing  $x < -1$ ,  $0 < x < 1$ ,  $x > 1$ ,    Increasing  $-1 < x < 0$ .
- Concave down  $x < -1$ ,  $-1 < x < 1$ ,    Concave up  $x > 1$ .
- Vertical Asymptotes  $x = -1$ ,  $x = 1$ . Horizontal Asymptote  $y = 1$ .
- $f(0) = 0$ .



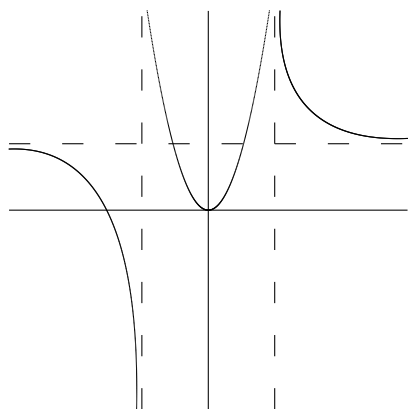
a)



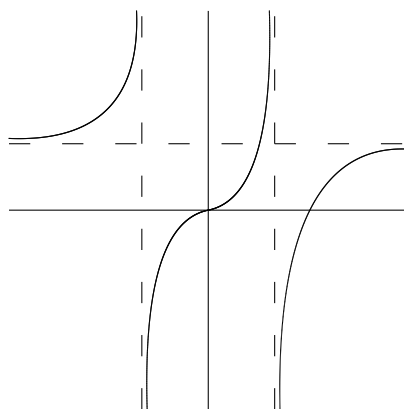
b)



c)



d)



e)

### Answers

1. a    2. b    3. e    4. d    5. b    6. e    7. e    8. b    9. a    10. e  
 11. a    12. c    13. a    14. a    15. c    16. d    17. d    18. b    19. b    20. e  
 21. c    22. d    23. d    24. c    25. b    26. b    27. c    28. d    29. d    30. a

Calculators are not allowed!

1. Find the derivative of  $y = (x + 1)(x^3 + 1)^{2/3}$ .

- a)  $\frac{2(x+1)}{3(x^3+1)^{2/3}} + 3(x^3+1)^{2/3}$     b)  $(x^3+1)^{2/3} + \frac{2x^3+2x^2}{(x^3+1)^{1/3}}$     c)  $(3x^2)^{-1/3}$   
 c)  $(x^3+1)^{2/3} + \frac{x^2(x+1)}{3(x^3+1)^{2/3}}$     d)  $(x^3+1)^{2/3} + \frac{2(x+1)}{3(x^3+1)^{1/3}}$     e)  $(x^3+1)^{2/3} + \frac{x^2(x+1)}{3(x^3+1)^{1/3}}$
- 

2. Evaluate  $\lim_{x \rightarrow 3} \frac{-x^2 + 2x + 3}{x^2 - 4x + 3}$ .    a) -2    b) -1    c) 0    d) 1    e) 2    f)  $\frac{0}{0}$     g) DNE3. Evaluate  $\int \csc^2 x + \csc x \cot x \, dx$     a)  $-\cot x - \csc x + C$     b)  $\sec^2 x + \sec x \tan x + C$   
 c)  $\csc x \cot x - \csc^2 x + C$     d)  $\cot x + \csc x + C$     e)  $\cot x - \csc^2 x + C$ 4. Evaluate  $\frac{d}{dx} \int_{2x}^{5x} \sin t \, dt$ 

- a)  $\sin 5x - \sin 2x$     b)  $5 \sin 5x - 2 \sin 2x$     c)  $\cos 5x - \sin 2x$     d)  $2 \sin 3x$     e)  $3 \sin 3x$
- 

5. Find the derivative,  $\frac{dy}{dx}$  or  $y'$ , of  $\frac{x}{y} - x = -4$  at  $(6, 3)$ .

- a) -1    b) 1    c) 3    d) -3    e)  $\frac{1}{3}$     f)  $-\frac{1}{3}$
- 

6.  $f(x) = e^{3x}$ . Evaluate  $\lim_{h \rightarrow 0} \frac{f(h) - f(0)}{h}$ .    a)  $\frac{0}{0}$     b) DNE    c) 0    d) 1    e) 2    f) 37. Find the  $x$  value of the point on the curve  $y = 2x + 2$  closest to the point  $(2, 1)$ .

- a)  $-\frac{3}{2}$     b) -1    c)  $-\frac{1}{2}$     d) 0    e)  $\frac{1}{2}$     f) 1    g)  $\frac{3}{2}$
- 

8. An airplane flying at an altitude of 5 miles passes directly over a radar antenna. When the airplane is 13 miles away from the antenna, the radar detects that the distance between the antenna and the airplane is changing at a rate of 240 mph. What is the horizontal speed of the airplane?

- a) 200 mph    b) 220 mph    c) 240 mph    d) 260 mph    e) 280 mph
- 

9. Let  $y = x^2 e^x$ . Where is  $y$  increasing?

- a)  $-2 < x < 0$     b)  $x < -2, x > 0$     c)  $x < 0, x > 2$     d)  $x > 2$     e)  $0 < x < 2$
-

10. Find the derivative of  $y = \tan^{-3}(x)$ .

- a)  $-3 \tan^{-4}(x) \sec^2(x)$     b)  $3 \tan^{-4}(x) \sec^2(x)$     c)  $3 \tan^{-2}(x) \sec^2(x)$   
d)  $-3 \tan^{-2}(x) \sec^2(x)$     e)  $\sec^{-4}(x)$
- 

11. Solve  $f'(x) = 1 - 6x$  for  $f(x)$  when  $f(0) = 8$ .

- a)  $f(x) = x - 3x^2$     b)  $f(x) = x + 3x^2 - 8$     c)  $f(x) = x + 3x^2 + 8$     d)  $f(x) = x - 3x^2 + 8$   
e)  $f(x) = x - 3x^2 - 8$
- 

12. Evaluate  $\int_1^2 6x^2 - 16 dx$ .    a)  $-2$     b)  $-1$     c)  $0$     d)  $1$     e)  $2$

---

13. Find the general antiderivative of  $x^{-1/5} + x^{1/5}$ .

- a)  $-5x^{4/5} + 5x^{6/5} + C$     b)  $-5x^{-6/5} + 5x^{-4/5} + C$     c)  $-5x^{4/5} + \frac{5}{4}x^{4/5} + C$   
d)  $\frac{-1}{5}x^{-6/5} + \frac{1}{5}x^{-4/5} + C$     e)  $\frac{5}{4}x^{4/5} + \frac{5}{6}x^{6/5} + C$
- 

14. Find the horizontal asymptote for  $y = \frac{2 - 6x^3 + x^4}{x^4 - 8x^2 - 9}$ .

- a)  $y = 9, y = -1$     b)  $y = 0$     c)  $y = 1$     d)  $y = 2$     e)  $y = 3, y = -3$
- 

15. Find the vertical asymptote(s) for  $y = \frac{2 - 6x^3 + x^4}{x^4 - 8x^2 - 9}$ .

- a)  $x = 1$     b)  $x = 1, x = 3$     c)  $x = 2$     d)  $x = 9, x = -1$     e)  $x = -3, x = 3$
- 

16. Find the absolute maximum of the function  $f(x) = x^2 + 2x - 4$  on the interval  $[-1, 1]$ .

- a)  $0$     b)  $-2$     c)  $5$     d)  $3$     e)  $2$     f)  $-1$     g)  $1$
- 

17. Find the absolute minimum of the function  $f(x) = x^2 + 2x - 4$  on the interval  $[-1, 1]$ .

- a)  $-10$     b)  $-6$     c)  $-3$     d)  $0$     e)  $-5$     f)  $3$     g)  $4$
- 

18.  $f(x) = 1/4x^4 - 27x$  and  $f'(x) = x^3 - 27$ . Where is  $f(x)$  concave down?

- a) nowhere    b) everywhere    c)  $3 < x$     d)  $x < 3$     e)  $x < 0$
- 

19. Evaluate  $\lim_{x \rightarrow -5^-} \frac{x^2}{(5+x)^3}$ .    a)  $\frac{25}{0}$     b)  $-\infty$     c)  $\infty$     d) DNE    e) None of the above

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20. Evaluate  $\int_0^2 \frac{x^3}{\sqrt{x^4+9}} dx$ . a) 0 b) 1 c) 2 d) 3 e) 4

---

21.  $y = \frac{x^3+1}{x^2}$ . Find  $y''$  at  $x = -1$ . a) -6 b) 0 c) 2 d) -2 e) -1 f) 1 g) 6

---

22. Evaluate  $\lim_{x \rightarrow 0^+} \frac{\ln x^2 + 3x}{\ln 2x}$ . a) 2 b) 1 c) 6 d)  $-\infty$  e)  $3/2$  f) -6

---

23. Find the derivative of  $y = \text{Arccos}(e^x)$ .

a)  $\frac{-e^x}{\sqrt{1-e^{2x}}}$  b)  $\frac{e^x}{\sqrt{1-e^{2x}}}$  c)  $\frac{e^x}{\sqrt{1-e^x}}$  d)  $-e^x \sin(e^x)$  e)  $\frac{1}{\sqrt{1-e^{2x}}}$  f)  $-\sin(e^x)$

---

24. Evaluate  $\int_0^{1/2} \frac{1}{\sqrt{1-4x^2}} dx$ . a) 0 b)  $-\frac{\pi}{2}$  c)  $\frac{\pi}{2}$  d)  $-\frac{\pi}{4}$  e)  $\frac{\pi}{4}$

---

25. Find the derivative of  $y = \frac{\ln^2 x}{x^2}$ .

a)  $\frac{2 \ln x - \ln^2 x}{x^4}$  b)  $\frac{2x \ln x - 2x \ln^2 x}{x^4}$  c)  $\frac{2 \ln x}{x^2}$  d)  $\frac{2 - 2 \ln x}{x^4}$  e) 0

---

26. Evaluate  $\int \frac{9x^4 + 3x}{x^{1/2}} dx$ .

a)  $\frac{9x^5 + 3x^2}{\frac{2x^{3/2}}{3}} + C$  b)  $2x^{9/2} + 2x^{3/2} + C$  c)  $9x^{7/2} + 3x^{1/2} + C$   
d)  $\frac{x^{1/2}(36x^3 + 10x) - (9x^4 + 5x^2)\frac{1}{2}x^{1/2}}{x}$  e)  $\frac{81}{2}x^{9/2} + \frac{9}{2}x^{3/2} + C$

---

27. Evaluate  $\int \frac{2x}{x^2\sqrt{x^4-1}} dx$ .

a)  $\ln|x^4-1| + C$  b)  $\text{Arcsec}(x^2) + C$  c)  $\text{Arcsec}(x^2-1) + C$  d)  $\ln|x^2| + C$   
e)  $x^2 \ln|x^4-1| + C$

---

28. Evaluate  $\lim_{x \rightarrow -1} \frac{\frac{1}{x+3} - \frac{1}{2}}{4x+4}$ . a) DNE b)  $\frac{0}{0}$  c)  $\frac{1}{32}$  d)  $-\frac{1}{32}$  e)  $\frac{1}{16}$  f)  $-\frac{1}{16}$

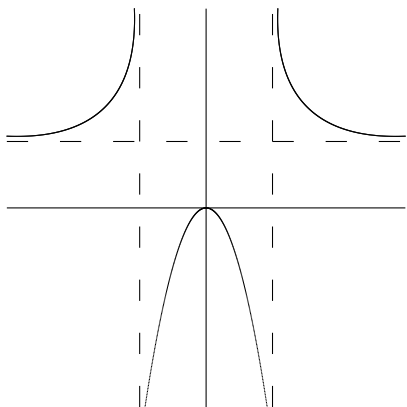
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29. Evaluate  $\lim_{x \rightarrow 3} \frac{\sqrt{3x+7}-4}{3-x}$  a)  $\frac{0}{0}$  b) DNE c)  $\frac{1}{8}$  d)  $\frac{1}{4}$  e)  $-\frac{3}{8}$  f)  $-\frac{1}{2}$  g)  $\frac{5}{8}$

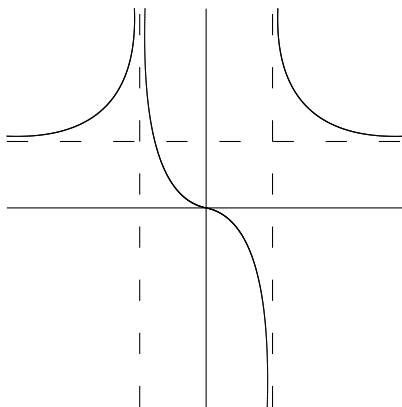
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30. Which of the following graphs most closely has the following properties:

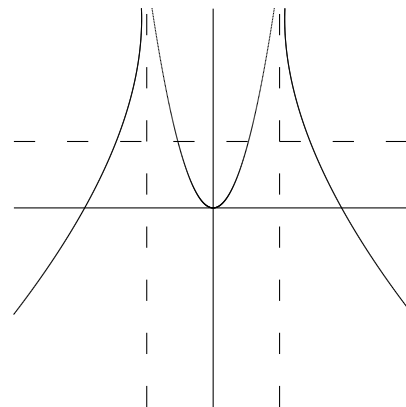
- Decreasing  $-1 < x < 0$ ,  $x > 1$ ,    Increasing  $x < -1$ ,  $0 < x < 1$ .
- Concave up  $x < -1$ ,  $-1 < x < 1$ ,  $x > 1$ .
- Vertical Asymptotes  $x = -1$ ,  $x = 1$ .
- $\lim_{x \rightarrow \infty} f(x) = 1$ .
- $f(0) = 0$ .



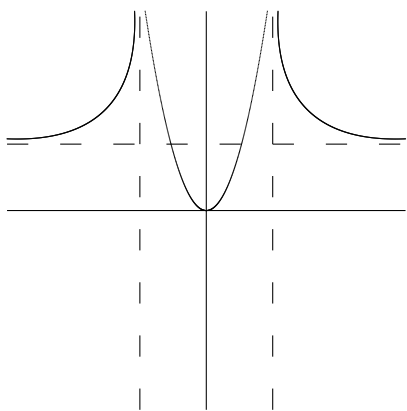
a)



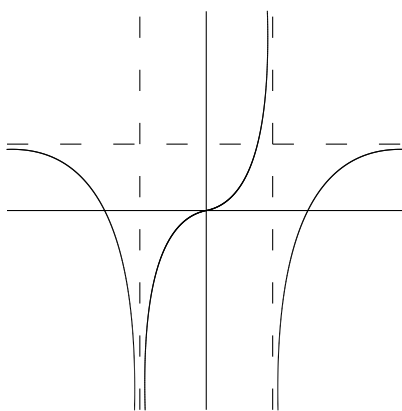
b)



c)



d)



e)

### Answers

1. b    2. a    3. a    4. b    5. a    6. f    7. d    8. d    9. b    10. a  
 11. d    12. a    13. e    14. c    15. e    16. f    17. e    18. a    19. b    20. b  
 21. g    22. a    23. a    24. e    25. b    26. b    27. b    28. f    29. e    30. d

Calculators are not allowed!

1. Find the derivative of  $y = x^2 \cos(x^2)$ .      a)  $-2x \sin(x^2)$       b)  $-4x^2 \sin(x^2)$   
c)  $2x[\cos(x^2) + x^2 \sin(x^2)]$       d)  $2x \cos(x^2) - x^2 \sin(x^2)$       e)  $2x \cos(x^2) - 2x^3 \sin(x^2)$
- 
2. Evaluate  $\lim_{x \rightarrow 4^-} \frac{x^2 + x - 20}{x^2 - 5x + 4}$ .      a) 1      b) 2      c) 3      d) 4      e) 5      f)  $\frac{0}{0}$       g) DNE
- 
3. Evaluate  $\int \sec x \tan x + \csc x \cot x \, dx$       a)  $\sec^2 x - \csc^2 x + C$       b)  $\sec x + \csc x + C$   
c)  $\sec^2 x + \csc^2 x + C$       d)  $\sec x - \csc x + C$       e)  $\tan x + \cot x + C$
- 
4. Evaluate  $\frac{d}{dx} \int_{x^2}^2 \sqrt{t} \, dt$   
a)  $-\sqrt{2x}$       b)  $\sqrt{2} - x$       c)  $x$       d)  $-2x$       e)  $-2x^2$
- 
5. Find the derivative,  $\frac{dy}{dx}$  or  $y'$ , of  $(x - y)^3 = -8$  at  $(1, 3)$ .  
a) 3      b) 2      c) 1      d)  $-1$       e)  $\frac{7}{4}$       f)  $-\frac{7}{4}$
- 
6.  $g(x) = \frac{4}{\sqrt{x}}$ . Evaluate  $\lim_{h \rightarrow 0} \frac{g(1+h) - g(1)}{h}$ .      a)  $\frac{0}{0}$       b) DNE      c) 0      d)  $-2$       e)  $-1$       f) 2
- 
7. A rectangular box is to have a square base (length =  $x$  and width =  $x$ ) and height  $y$  with a volume of 8 cubic feet. If the material for the base costs 30 cents per square foot, the material for the sides costs 20 cents per square foot, and the material for the top costs 10 cents per square foot, what value of  $x$  minimizes the cost?  
a) 0      b) 1      c) 2      d) 3      e) 4      f) 5
- 
8. The volume of a sphere ( $V = \frac{4}{3}\pi r^3$ ) is increasing at 14 ft<sup>3</sup>/min. How fast is the surface area ( $S = 4\pi r^2$ ) increasing when the radius is 4 ft?  
a) 7      b) 14      c) 21      d) 28      e) DNE
- 
9. Let  $y = x^2 - 2x$ . Where is  $y$  increasing?  
a)  $x < -1$       b)  $x > -1$       c)  $-1 < x < 1$       d)  $x < 1$       e)  $x > 1$
-

10. Find the derivative of  $y = \sec^3(x)$ .      a)  $-3 \sec^3(x) \tan(x)$       b)  $3 \sec^3(x) \tan(x)$   
c)  $3 \sec(x) \tan(x)$       d)  $3 \sec^2(x) \tan^2(x)$       e)  $3 \sec^3(x) \tan^3(x)$
- 

11. Solve  $f'(x) = \sqrt{x}(6 + 5x)$  for  $f(x)$  when  $f(1) = 10$ .  
a)  $f(x) = 4x^{3/2} + 2x^{5/2} + 2$       b)  $f(x) = 4x^{3/2} + 2x^{5/2} - 2$       c)  $f(x) = 4x^{3/2} + 2x^{5/2} + 4$   
d)  $f(x) = 4x^{3/2} + 2x^{5/2} - 4$       e)  $f(x) = 4x^{3/2} - 2x^{5/2} - 4$
- 

12. Evaluate  $\int_1^2 4x^3 - 3x^2 + 1 \, dx$ .      a) 7      b) 8      c) 9      d) 10      e) 11      f) 12
- 

13. Find the general antiderivative of  $2x^{1/2} - 5x^{-1/7}$ .  
a)  $\frac{4}{3}x^{3/2} - \frac{35}{6}x^{6/7} + C$       b)  $\frac{4}{3}x^{3/2} + \frac{5}{7}x^{-8/7} + C$       c)  $x^{3/2} + \frac{5}{7}x^{6/7} + C$   
d)  $\frac{4}{3}x^{-1/2} + \frac{35}{6}x^{-8/7} + C$       e)  $x^{-1/2} + \frac{5}{7}x^{-8/7} + C$
- 

14. Find the horizontal asymptote for  $y = \frac{1 - 7x^2 + 5x^3}{x^4 - 16}$ .  
a)  $y = 1$       b)  $y = 0$       c)  $y = 5$       d)  $y = -1$       e)  $y = 2, y = -2$
- 

15. Find the vertical asymptote(s) for  $y = \frac{1 - 7x^2 + 5x^3}{x^4 - 16}$ .  
a)  $x = -2, x = 2$       b)  $x = 1$       c)  $x = 4$       d)  $x = 5$       e)  $x = -4, x = 4$
- 

16. Find the absolute maximum of the function  $f(x) = x^4 - 3x^2$  on the interval  $[-1, 2]$ .  
a) 0      b) -2      c) -4      d) 4      e) 2      f) -1      g) 10
- 

17. Find the absolute minimum of the function  $f(x) = x^4 - 3x^2$  on the interval  $[-1, 2]$ .  
a)  $-\frac{4}{3}$       b) -3      c) -1      d)  $-\frac{2}{5}$       e)  $-\frac{9}{4}$       f) 0      g) -4
- 

18.  $f(x) = x^3 + x^2$  and  $f'(x) = 3x^2 + 2x$ . Where is  $f(x)$  concave up?  
a)  $x < -2/3$       b)  $x < -2/3, x > 0$       c)  $-2/3 < x < 0$   
d)  $x > -1/3$       e)  $x < -1/3$
- 

19. Evaluate  $\lim_{x \rightarrow 2^+} \frac{4}{(x-2)^3}$ .      a)  $\frac{4}{0}$       b)  $-\infty$       c)  $\infty$       d) DNE      e) None of the above
-

20. Evaluate  $\int xe^{x^2} dx$ .    a)  $e^{x^2} + C$     b)  $\frac{x^2}{2}e^{x^2} + C$     c)  $\frac{1}{2x}e^{x^3} + C$     d)  $\frac{1}{2}e^{x^2} + C$

---

21.  $y = \frac{x+3}{x+2}$ . Find  $y''$  at  $x = 0$ .    a)  $3/2$     b)  $-1/2$     c)  $1$     d)  $-1$     e)  $1/2$     f)  $1/4$

---

22. Evaluate  $\lim_{x \rightarrow 0} \frac{e^{-2x} - (x-1)^2}{x^2}$ .    a)  $\infty$     b)  $0$     c)  $2$     d)  $-2$     e)  $1$     f)  $-1$

---

23. Find the derivative of  $y = \text{Arccot}(5x)$ .

a)  $\frac{-1}{1+5x}$     b)  $\frac{5}{1+25x^2}$     c)  $-5\text{csc}(5x)$     d)  $\frac{1}{1+5x}$     e)  $\frac{-5}{1+25x^2}$

---

24. Evaluate  $\int_0^1 \frac{-1}{1+x^2} dx$ .    a)  $0$     b)  $-\frac{\pi}{2}$     c)  $\frac{\pi}{2}$     d)  $-\frac{\pi}{4}$     e)  $\frac{\pi}{4}$

---

25. Find the derivative of  $y = x^2e^x$  at  $x = 1$ .

a)  $0$     b)  $e$     c)  $2e$     d)  $3e$     e)  $4e$

---

26. Evaluate  $\int \frac{7x^3 + 5x^2}{x^{1/2}} dx$ .

a)  $\frac{7x^4 + 5x^3}{\frac{2x^{3/2}}{3}} + C$     b)  $2x^{7/2} + 2x^{5/2} + C$     c)  $7x^{7/2} + 3x^{3/2} + C$   
d)  $\frac{x^{1/2}(28x^4 + 15x) - (7x^4 + 5x^3)\frac{1}{2}x^{1/2}}{x}$     e)  $\frac{49}{2}x^{7/2} + \frac{25}{2}x^{5/2} + C$

---

27. Evaluate  $\int \frac{7x^5}{1+3x^6} dx$ .

a)  $\frac{7}{6}x^6 \ln|1+3x^6| + C$     b)  $7 \ln|1+3x^6| + C$     c)  $\frac{7}{6} \text{Arctan}(1+3x^6) + C$     d)  $\frac{\text{Arctan}(x^3)}{3} + C$   
e)  $\frac{7}{18} \ln|1+3x^6| + C$

---

28. Evaluate  $\lim_{x \rightarrow 1} \frac{\frac{2}{x+2} - \frac{2}{1-4x}}{2x+2}$ .    a) DNE    b)  $\frac{0}{0}$     c)  $1$     d)  $-\frac{1}{3}$     e)  $\frac{1}{3}$     f)  $-1$     g)  $0$

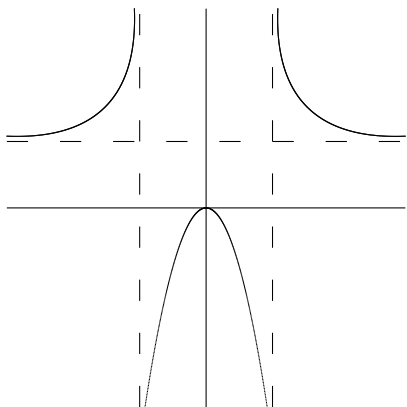
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29. Evaluate  $\lim_{x \rightarrow 4} \frac{\sqrt{x-3} - 1}{4-x}$     a)  $\frac{0}{0}$     b) DNE    c)  $-1$     d)  $\frac{1}{2}$     e)  $\frac{2}{7}$     f)  $1$     g)  $-\frac{1}{2}$

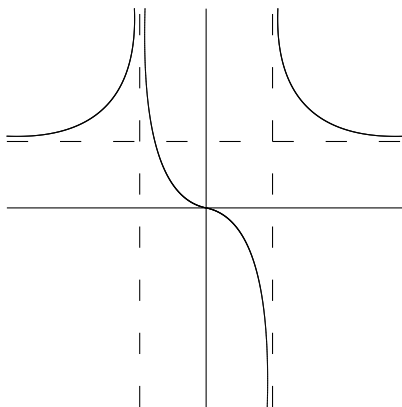
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30. Which of the following graphs most closely has the following properties:

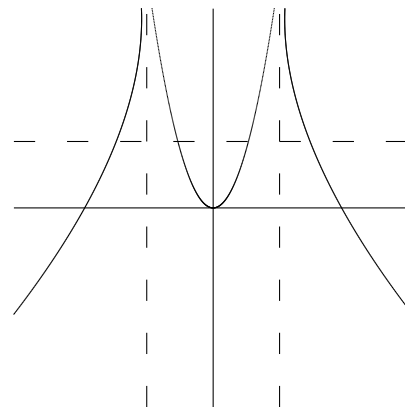
- Decreasing  $-1 < x < 0$ ,  $0 < x < 1$ ,  $x > 1$ ,    Increasing  $x < -1$ .
- Concave up  $x < -1$ ,  $-1 < x < 0$ ,  $x > 1$ ,    Concave down  $0 < x < 1$ .
- Vertical Asymptotes  $x = -1$ ,  $x = 1$ .
- $\lim_{x \rightarrow \infty} f(x) = 1$ .
- $f(0) = 0$ .



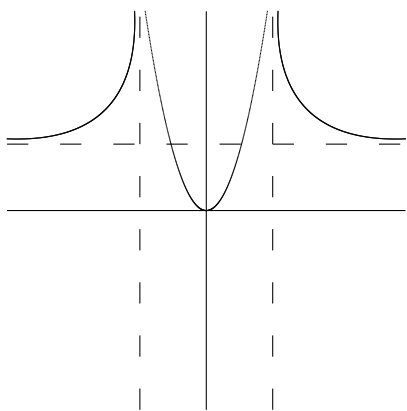
a)



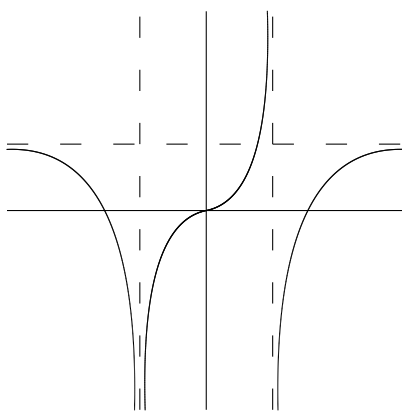
b)



c)



d)



e)

### Answers

1. e    2. c    3. d    4. e    5. c    6. d    7. c    8. a    9. e    10. b  
 11. c    12. c    13. a    14. b    15. a    16. d    17. e    18. d    19. c    20. d  
 21. f    22. e    23. e    24. d    25. d    26. b    27. e    28. e    29. g    30. b