

Your Name:

Instructor: Steven Clontz

Draw a box around your final answer. You must show all work to receive credit.

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1. Integration by Parts (7.1)

(a: #2) Find  $\int \theta \cos(\pi\theta) d\theta$ .

(b: #14) Find  $\int (r^2 + r + 1)e^r dr$ .

(c: #18) Find  $\int_0^{\pi/2} x^3 \cos(2x) dx$ .

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2. Integration by Parts with Cycling (7.1)

(a: #24) Find  $\int e^{-2x} \sin(2x) dx$ .

(b) Find  $\int 12 \sec^2(2z) \tan(2z) dz$  using integration by parts.

(c) Check (b) using substitution.

(See 7.1 #1-30 for more examples of integration by parts.)

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3. Trigonometric Integrals using Pythagorean Identities (7.2)

(a: #6) Find  $\int_0^{\pi/2} 7 \cos^7(t) dt$ .

(b: Based on #12) Find  $\int \sin(2x) \cos^2(2x) dx$ .

(c: #24) Find  $\int e^x \sec^3(e^x) dx$

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4. Trigonometric Integrals using Half-Angle Identities (7.2)

(a: #16) Find  $\int_0^\pi \sqrt{1 - \cos(2x)} dx$

(b: Based on #8) Find  $\int \cos^4(2\pi x) dx$

(c: Based on #10) Find  $\int 8 \sin^4(y) \cos^2(y) dy$

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5. Trigonometric Integrals using Product Identities (7.2)

(a) Find  $\int \sin(2x) \cos(3x) dx$ .

(b) Find  $\int \sin(2x) \sin(3x) dx$ .

(c) Find  $\int \cos(2x) \cos(3x) dx$ .

(See 7.2 #1-38 for more examples of trigonometric integrals.)

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6. Trigonometric Substitution (7.3)

(a: #2) Find  $\int \frac{3dy}{\sqrt{1+9y^2}}$ .

(b: #10) Find  $\int \frac{5}{\sqrt{25x^2 - 9}} dx$  for  $x > 3/5$ .

(c: #18) Find  $\int \frac{\sqrt{9 - w^2}}{w^2} dw$

(See 7.3 #1-28 for more examples of trigonometric substitution.)

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7. Integration by Partial Fractions (7.4)

(a: #8) Expand  $\frac{t^4 + 9}{t^4 + 9t^2}$  using partial fractions.

(b: #10) Find  $\int \frac{dx}{x^2 + 2x}$ .

(c: #24) Find  $\int \frac{8x^2 + 3x + 2}{(4x^2 + 1)^2}$ .

(d: #30) Find  $\int \frac{x^4}{x^2 - 1} dx$ .

(See 7.4 #1-34 for more examples of partial fractions.)

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8. Improper Integrals: Type I (7.7)

(a: Based on #1) Evaluate  $\int_{-\infty}^0 \frac{1}{1+x^2} dx$ .

(b: #14) Find  $\int_{-\infty}^{\infty} \frac{x dx}{(x^2+4)^{3/2}}$ .

(c: #22) Find  $\int_0^{\infty} 2e^{-\theta} \sin(\theta) d\theta$ .

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9. Improper Integrals: Type II (7.7)

(a: #4) Find  $\int_0^4 \frac{dx}{\sqrt{4-x}}$ .

(b: #26) Find  $\int_0^1 -\ln(x)dx$ .

(c: Based on #16) Find  $\int_0^2 \frac{s}{\sqrt{4-s^2}} ds$ .

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10. Improper Integral Convergence

(a: #50) Does  $\int_0^{\infty} \frac{d\theta}{1 + e^{\theta}}$  converge or diverge?

(b: #44) Does  $\int_0^2 \frac{dx}{1 - x}$  converge or diverge?

(See 7.7 #1-64 for more examples of improper integrals.)

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