# §5.5 The Substitution Rule

**1.** $\displaystyle\int 6(x-4)^5\, dx$

**2.** $\displaystyle\int \frac{t^2-3}{-t^3+9t+1}\, dt$

**3.** Suppose $f$ is an odd function. For $a > 0$, find $\int_{-a}^{a} f(x)\, dx$.

# §6.1 Integration by Parts

**4.** $\displaystyle\int z^2 \ln z\, dz$

**5.** $\displaystyle\int e^{2x} \sin x\, dx$

# §6.2 Trigonometric Integrals and Substitutions

**6.** $\displaystyle\int \frac{dx}{x^2\sqrt{9-x^2}}$

**7.** $\displaystyle\int \frac{dx}{\sqrt{4x^2+1}}$

**8.** $\displaystyle\int \sin^4 x \cos^3 x\, dx$

**9.** $\displaystyle\int_{\sqrt{3}}^{2} \frac{\sqrt{x^2-3}}{x}\, dx$

# §6.3 Partial Fractions

**10.** $\displaystyle\int \frac{5x^2+20x+6}{x^3+2x^2+x}\, dx$

**11.** $\displaystyle\int \frac{8x^3+13x}{(x^2+2)^2}\, dx$

# §6.5 Approximate Integration

**12.** Use the Trapezoid Rule with $n=4$ intervals to approximate $\displaystyle\int_0^{\pi} \sin\theta\, d\theta$.

**13.** Use Simpson's Rule with $n=4$ intervals to approximate $\displaystyle\int_0^{\pi} \sin\theta\, d\theta$.

# §6.6 Improper Integrals

Evaluate each integral below if it converges. If it diverges, clearly state that it diverges.

**14.** $\displaystyle\int_0^{\infty} e^{-x}\, dx$

**15.** $\displaystyle\int_{-\infty}^{\infty} \frac{e^x}{1+e^{2x}}\, dx$

**16.** $\displaystyle\int_{-1}^{2} \frac{dx}{x^3}$

**17.** $\displaystyle\int_0^{\infty} \frac{1}{(x+1)\sqrt{x}}\, dx$

1. $(x-4)^6 + C$

2. $-\dfrac{1}{3}\ln|-t^3 + 9t + 1| + C$

3. $0$

4. $\dfrac{z^3}{3}\ln z - \dfrac{z^3}{9} + C$

5. $\dfrac{1}{5}e^{2x}(2\sin x - \cos x) + C$

6. $-\dfrac{\sqrt{9-x^2}}{9x} + C$

7. $\dfrac{1}{2}\ln\left|\sqrt{4x^2 + 1} + 2x\right| + C$

8. $\dfrac{1}{5}\sin^5 x - \dfrac{1}{7}\sin^7 x + C$

9. $1 - \dfrac{\sqrt{3}}{6}\pi$

10. $6\ln|x| - \ln|x+1| - \dfrac{9}{x+1} + C$

11. $4\ln(x^2 + 2) + \dfrac{3}{2(x^2+2)} + C$

12. $\dfrac{\pi}{8}\left(0 + \sqrt{2} + 2 + \sqrt{2} + 0\right) \approx 1.896$

13. $\dfrac{\pi}{12}\left(0 + 2\sqrt{2} + 2 + 2\sqrt{2} + 0\right) \approx 2.005$

14. $1$

15. $\dfrac{\pi}{2}$

16. The integral diverges.

17. $\pi$