Practice Problems on Chapter 7, 8, and 9.
1. Find the inverse function for \( f(x) = \frac{x - 2}{x + 2} \).

2. Find the domain of the inverse function of \( f(x) = \sqrt{3 + 7x} \).

3. Find the interval on which \( f(x) = \frac{e^x}{x} \) is increasing.

4. Solve the equation \( \log_2(\ln x) = 1 \).

5. A bacteria culture starts with 200 bacteria and in 1 hour contains 400 bacteria. How many hours does it take to reach 2000 bacteria?

6. Find \( f'(1) \), \( f(x) = \ln(x^2) \).

7. Find \( f'(0) \), \( f(x) = \ln(3x^2 + 1 + e^{-x}) \).

8. Evaluate \( \int_0^\infty e^{-x} \cos x \, dx \).

9. Evaluate \( \int xe^{3x} \, dx \).

10. Evaluate \( \int \frac{2x + 1}{(x^2 + 1)(3x - 1)} \, dx \).

11. Evaluate \( \int \frac{1}{x(2x - 1)^2} \, dx \).

12. Evaluate \( \int \frac{1}{x(x - 1)} \, dx \).

13. Evaluate \( \int \frac{1}{x(x - 1)} \, dx \).

14. Find the length of the curve \( y^2 = x^3 \) from \((0,0)\) to \( \left( \frac{1}{4}, \frac{1}{8} \right) \).

15. Find the length of the curve \( y = \ln(\cos x) \), \( 0 \leq x \leq \frac{\pi}{3} \).

16. Find the area of the surface obtained by rotating \( y = 2x \), \( 0 \leq x \leq 1 \), about the x-axis.

17. A right circular tank of height 1 foot and radius 1 foot is full of water. Taking the density of water to be 60 pounds per cubic foot. Find the hydrostatic force in pounds on the side of the tank.

18. Find the moments and center of mass of a system consisting of:
\( m_1 = 2, m_2 = 3, m_3 = 5; P_1(5,1), P_2(3,-2), P_3(-2,4) \).

19. Find the y-coordinate \( \bar{y} \) at the centroid of the region bounded by the curves \( y = x^2 \) and \( y = 1 \).
Solutions

1. \( f^{-1}(x) = \frac{2+2x}{1-x} \)
2. \([0, \infty)\)
3. \((1, \infty)\)
4. \(e^2\)
5. \(\frac{\ln 10}{\ln 2}\)
6. 2
7. \(-1/2\)
8. \(\frac{e^x - 1}{2}\)
9. \(\frac{xe^{3x}}{3} - \frac{e^{3x}}{9} + C\)
10. \(-\frac{4}{3} \ln(x^2 + 1) + \frac{4}{3} \arctan x + \frac{4}{3} \ln |x + 1| + C\)
11. \(6\sqrt{2}\)
12. \(\frac{1}{\ln 2}\)
13. Divergent
14. \(61/16\)
15. \(\ln(2 + \sqrt{3})\)
16. \(2\pi\sqrt{3}\)
17. \(60\pi\)
18. \(M_x = 1.6, M_y = 9; (\bar{x}, \bar{y}) = (0.9, 1.6)\)
19. 0.60