

## 7. Transcendental Functions

14. Hint:  $f'(r) = -\cos^4 r$

18.  $f^{-1}(x) = 1 - x^2, x \leq 0$

20.  $f^{-1}(x) = 2 + \frac{1}{x^2}, x > 0$

28.  $f^{-1}(x) = \left( \frac{2 - x^{1/5}}{x^{1/5} - 1} \right)^{1/3}$

38.  $\frac{1}{10}$

44. (a)  $f^{-1}(x) = -\frac{dx - b}{cx - a}$

(b) If  $bc - ad = 0$ , then  $f(x)$  is either a constant function or undefined.

(c)  $f = f^{-1}$  if  $a = -d$  or if  $f$  is the identity function (i.e.  $f(x) = x$ ).

## Problem Set 7.1

6.  $\frac{3}{2(3x - 2)}$

10.  $-\frac{1}{x^3} - \frac{3(\ln x)^2}{x}$

12.  $\frac{1}{\sqrt{x^2 - 1}}$

16.  $-\frac{1}{2} \ln |1 - 2x| + C$

20.  $\frac{1}{\ln x} + C$

28.  $(x^2 + 3x)(x - 2)(x^2 + 1) \cdot \left( \frac{2x + 3}{x^2 + 3x} + \frac{1}{x - 2} + \frac{2x}{x^2 + 1} \right)$

30.  $\frac{(x^2 + 3)^{2/3}(3x + 2)^2}{\sqrt{x + 1}} \cdot \left[ \frac{4x}{3(x^2 + 3)} + \frac{6}{3x + 2} - \frac{1}{2(x + 1)} \right]$

38.  $x = e^{-1/2} \approx 0.606$

46.  $[-\ln |\cos x|]_0^{\pi/3} = \ln 2 \approx 0.693$

## Problem Set 7.2

4.  $f(x)$  is not one-to-one, so it does not have an inverse.

10. Hint:  $f'(x) = -\csc^2 x$

## Problem Set 7.3

8.  $\frac{e^x}{x}$

10.  $x^{2-y}$

12.  $e^{2x^2-x}(4x - 1)$

16.  $\frac{e^{x/\ln x}(\ln x - 1)}{(\ln x)^2}$

22.  $-1$ . Hint: use implicit differentiation.

30.  $\frac{1}{2}e^{x^2-3} + C$

34.  $e^{e^x} + C$ . Hint:  $e^{x+e^x} = e^x \cdot e^{e^x}$ .

$$36. \left[ -\frac{1}{3}e^{3/x} \right]_1^2 \approx 5.2$$

$$38. V = 2\pi \int_0^1 xe^{-x^2} dx = \pi(1 - e^{-1}) \approx 1.99$$

$$46. (a) A = \int_0^1 (e^x - ex) dx = \frac{e}{2} - 1 \approx 0.36$$

$$(b) V = \pi \int_0^1 [(e^x)^2 - (ex)^2] dx = \frac{\pi}{6}(e^2 - 3) \approx 2.30$$

### Problem Set 7.4

$$6. \frac{1}{128}$$

$$8. \frac{3}{4}$$

$$16. 1 + \frac{\ln 12}{\ln 4} \approx 2.7925$$

$$20. \frac{3x^2}{(x^3 + 9) \ln 10}$$

$$22. \frac{1}{2} \sqrt{\log_{10} 3} (\theta^2 - \theta)^{-1/2} (2\theta - 1)$$

$$26. \left[ \frac{10^{3x} - 10^{-3x}}{3 \ln 10} \right]_0^1 \approx 144.76$$

$$30. 2^{(e^x)} e^x \ln 2 + (2^e)^x e \ln 2$$

$$32. \underbrace{(2 \ln x)}_{\ln x^2}^{2x+3} \left[ 2 \ln \underbrace{(2 \ln x)}_{\ln x^2} + \frac{2x+3}{x \ln x} \right]$$

### Problem Set 7.5

$$4. 3e^{-0.003(t+2)}$$

12. About 8.53 days

14. About 5565 years ago

16. About 19.78 minutes later

20. About \$6182

26. (a) 1 (b) 1 (c)  $\infty$  (d) 0 (e)  $e$

30. About 33 days

### Problem Set 7.7

$$4. -\frac{\sqrt{2}}{2}$$

$$8. -\frac{\sqrt{3}}{3}$$

$$20. \tan^{-1} \frac{x}{6}$$

$$24. \tan^{-1} \frac{5}{\sqrt{x^2 - 25}} - \tan^{-1} \frac{2}{\sqrt{x^2 - 25}}$$

$$28. -\frac{16}{65} \approx -0.25$$

32. Hint: draw a picture.

$$34. (a) \frac{\pi}{2} \quad (b) \frac{\pi}{2}$$

$$36. e^{\tan x} \sec^2 x$$

40.  $-\frac{e^x}{\sqrt{1-e^{2x}}}$

42.  $e^x \left( \frac{2x}{\sqrt{1-x^4}} + \sin^{-1}(x^2) \right)$

56.  $[-\tan^{-1}(\cos \theta)]_0^{\pi/2} = \frac{\pi}{4}$

58.  $\tan^{-1}(e^x) + C$