SECTION 3.4

ANSWERS TO EVEN PROBLEMS

(4) $y' = -x^2 \csc^2 x + 2x \cot x + \frac{2}{x^3}$

(10) $y' = \frac{-x\sin x - \cos x}{x^2} + \frac{\cos x + x \sin x}{\cos^2 x}$

(16) $s' = \frac{1}{\cos t - 1}$

(22) $p' = -\sin q - \csc^2 q$

(38) $y' = -\sqrt{2} \csc x \cot x - \csc^2 x = \frac{-1}{\sin x} \; \frac{\sqrt{2}\cos x + 1}{\sin x}$

(a) if $x = \frac{\pi}{4}$, then $y' = -4$; the tangent line is
$y = -4x + \pi + 4$

(b) To find the location of the horizontal tangent,
set $y' = 0 \Rightarrow \cos x = \frac{-\sqrt{2}}{2} \Rightarrow x = \frac{3\pi}{4}$ radians.
When $x = \frac{3\pi}{4}$, $y = 2$ is the horizontal tangent.

(40) $\sqrt{2}$

SECTION 3.5

(26) $s' = \frac{3\pi}{2}\left(\cos \frac{2\pi t}{2} - \sin \frac{3\pi t}{2} \right)$

(32) $y = (5-2x)^{-3} + \frac{1}{8}\left(\frac{2}{x} + 1\right)^4 \Rightarrow$
$y' = 6(5-2x)^{-4} - \frac{1}{x^2}\left(\frac{2}{x}+1\right)^3 = \frac{6}{(5-2x)^4} - \frac{\left(\frac{2}{x}+1\right)^3}{x^2}$

(38) $y' = \left(27x^4 - 18x^3 + 6x^2 + 18x - 6\right) e^{x^3}$

(44) $r' = \frac{-1}{\theta^2} \sec\sqrt{\theta} \sec^2 \frac{1}{\theta} + \frac{1}{2\sqrt{\theta}} \tan\left(\frac{1}{\theta}\right) \sec\sqrt{\theta} \tan\sqrt{\theta}$

(50) $y' = 2\pi \sec^2 \pi t \cdot \tan \pi t$

(56) $y' = \frac{-5}{3} \sin\left(5 \sin\left(\frac{t}{3}\right)\right)\left(\cos\left(\frac{t}{3}\right)\right)$

(66) $y' = (x^2+2x)e^x \cos(x^2 e^x)$

Use triple product rule: $(fgh)' = f'gh + fg'h + fgh'$

to find $y'' = (x^2+4x+2)e^x \cos(x^2e^x) - xe^{2x}(x^3+4x^2+4x) \cdot \sin(x^2e^x)$

(68) $g(x) = (1-x)^{-1} \Rightarrow g'(x) = \frac{1}{(1-x)^2}$

$g(-1) = \frac{1}{2}$ and $g'(-1) = \frac{1}{4}$

$f(u) = 1 - \frac{1}{u} \Rightarrow f'(u) = \frac{1}{u^2}$

$f'(g(-1)) = f'\left(\frac{1}{2}\right) = 4 \Rightarrow (f \circ g)'(-1) = f'(g(-1))\, g'(-1) =$

$= 4 \cdot \frac{1}{4} = 1$

SECTION 3.6

(10) $y' = \frac{1}{(x^2+1)^{3/2}}$

(16) $g'(x) = \frac{2}{3}\left(2x^{-\frac{1}{2}}+1\right)^{-\frac{4}{3}} x^{-\frac{3}{2}}$

(22) $y' = \frac{y-3x^2}{3y^2-x}$

(30) $y' = \frac{y-1}{\cos y - x}$

(40) $y' = \frac{1}{y+1} = (y+1)^{-1} \Rightarrow y'' = \frac{-1}{(y+1)^3}$

SECTION 3.7

(8) $\left.\dfrac{df^{-1}}{dx}\right|_{x=f(3)} = \dfrac{1}{\left.\dfrac{df}{dx}\right|_{x=3}} = \dfrac{1}{9}$

(14) $\dfrac{dy}{dt} = \dfrac{3}{2t}$

(20) $y' = \dfrac{3(\ln x)^2}{x}$

(30) $y' = \dfrac{1}{x(\ln x)\cdot \ln(\ln x)}$

(36) $y = \left(\ln(t^{\frac{1}{2}})\right)^{\frac{1}{2}} \Rightarrow y' = \frac{1}{2}\left(\ln t^{\frac{1}{2}}\right)^{-\frac{1}{2}} \cdot \dfrac{1}{t^{\frac{1}{2}}} \cdot \dfrac{1}{2} t^{-\frac{1}{2}} \Rightarrow$

$y' = \dfrac{1}{4t\sqrt{\ln\sqrt{t}}}$

(52) $\dfrac{y'}{y} = \dfrac{5}{x+1} - \dfrac{5}{2x+1} \Rightarrow y' = \sqrt{\dfrac{(x+1)^{10}}{(2x+1)^5}}\left(\dfrac{5}{x+1} - \dfrac{5}{2x+1}\right)$

(62) $y' = e^{\sin t}\left(\left(\ln(t^2+1)\right)(\cos t) + \dfrac{2}{t}\right)$

(82) $y = \dfrac{\ln(\sin\theta) + \ln(\cos\theta) - \theta - \theta\ln 2}{\ln 7}$

$\dfrac{dy}{d\theta} = \dfrac{1}{\ln 7}\left(\cot\theta - \tan\theta - 1 - \ln 2\right)$

(96) $\ln y = (\ln x)\cdot\ln(\ln x) \Rightarrow \dfrac{y'}{y} = \dfrac{\ln(\ln x)}{x} + \dfrac{1}{x} \Rightarrow$

$y' = \dfrac{\ln(\ln x)+1}{x}\cdot(\ln x)^{\ln x}$

SECTION 3.8

(4) (a) $\frac{\pi}{6}$ (b) $\frac{-\pi}{4}$ (c) $\frac{\pi}{3}$

(20) $\cot\left(\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right) = \cot\left(\frac{-\pi}{3}\right) = \frac{-1}{\sqrt{3}}$

(38) $\frac{\sqrt{25-y^2}}{5}$

(44) $-\frac{\pi}{2}$

(52) $y' = \frac{-1}{\sqrt{2t-t^2}}$

(58) $y' = \frac{-6}{t\sqrt{t^4-9}}$

(64) $y' = \frac{e^{-t}}{\sqrt{1-e^{-2t}}}$