HW # 7 : MA 131

Section 3.2

5.) $f(x) = x^5$

$g(x) = x^3 + 8x - 2$

10.) $f(x) = x^3 + \frac{1}{x}$

$g(x) = 4x - 3$

14.) Using product rule

$y' = 15x^2(2-x)^4 - 20x^3(2-x)^3$

21.) $h'(x) = 2x\, f'(x^2)$

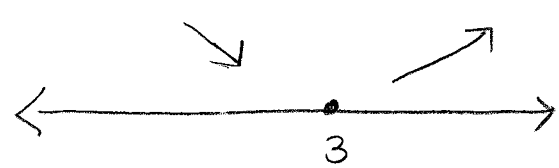
26.) $h'(x) = \frac{1}{2\sqrt{f(x^2)}}\, 2x\, f'(x^2) = \frac{x\, f'(x^2)}{\sqrt{f(x^2)}}$

34.) $f'(x) = \frac{-4}{x^2} + 2x$

$g'(x) = +4x^3$

$\frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x) = \left[\frac{-4}{(1-x^4)^2} + 2(1-x^4)\right](-4x^3)$

48.) $0 = f'(x) = \frac{2x-6}{2\sqrt{x^2-6x+10}}$



$0 = 2x - 6$

$x = 3$

$f'(4) > 0$

$f'(0) < 0$

Local min at $x = 3$

$f(3) = \sqrt{9 - 18 + 10} = \sqrt{1} = 1$

Local Minimum $= (3, 1)$

Section 3.3

41.) $\frac{dA}{dx} = \frac{6 \cdot 2x}{2\sqrt{x^2 - 400}} = \frac{6x}{\sqrt{x^2 - 400}}$

$$\frac{dA}{dt} = \frac{6x}{\sqrt{x^2 - 400}} \frac{dx}{dt}$$

$x = 25 \qquad \frac{dx}{dt} = 2$

$$\boxed{\frac{dA}{dt} = \frac{6 \cdot 25}{\sqrt{25^2 - 400}} \cdot 2 = 20}$$

44.) $\frac{dV}{dt} = \frac{3\pi x^2}{6} \frac{dx}{dt} = \frac{\pi x^2}{2} \frac{dx}{dt}$

$x = 10 \qquad \frac{dx}{dt} = .4$

$$\boxed{\frac{dV}{dt} = \frac{\pi \cdot 10^2}{2}(.4) = \pi \cdot 50 \cdot .4 = 20\pi}$$

45. a) $x^2 + y^2 = 100$

b) $y(t) = \sqrt{100 - [x(t)]^2}$

$$y'(t) = \frac{-2x(t)}{2\sqrt{10 - [x(t)]^2}} x'(t)$$

$x(t) = 8 \quad x'(t) = 3$

$$\boxed{y'(t) = \frac{-16}{2\sqrt{100-64}} 3 = \frac{-48}{2 \cdot 6} = -4}$$

Ch 3 Supp Ex

40. a) Population Growth Rate $= \frac{dP}{dt}$

Rate of change of anesthetic usage w.r.t. population size $= \frac{dA}{dP}$

RoC of surgical operations w.r.t. population size $= \frac{dS}{dP}$

RoC of anesthetic usage w.r.t. number of surgical operations $= \frac{dA}{dS}$

50.) $\frac{dV}{dt} = .01\pi r \frac{dr}{dt}$

$\frac{dV}{dt} = 20 \qquad r = 50$

$20 = .01 \cdot \pi \cdot 50 \cdot \frac{dr}{dt}$

$$\boxed{\frac{dr}{dt} = \frac{20}{.01 \cdot \pi \cdot 50} \approx 12.732}$$