4.1 July 15th

(1) $y = 12x^3 - 8x^2 + 7x + 5$, $y' = 36x^2 - 16x + 7$

(5) $f(x) = 6x^{3.5} - 10x^{0.5}$, $f'(x) = 6(3.5x^{2.5}) - 10(0.5x^{-0.5})$

$= 21x^{2.5} - 5x^{-0.5}$

(9) $y = 10x^{-3} + 5x^{-4} - 8x$, $y' = 10(-3x^{-4}) + 5(-4x^{-5}) - 8$

$= -30x^{-4} - 20x^{-5} - 8$

(13) $y = \frac{6}{x^4} - \frac{7}{x^3} + \frac{3}{x} + \sqrt{5}$

$= 6x^{-4} - 7x^{-3} + 3x^{-1} + \sqrt{5}$

$y' = 6(-4x^{-5}) - 7(-3x^{-4}) + 3(-x^{-2}) + 0$

$= \frac{-24}{x^5} + \frac{21}{x^4} - \frac{3}{x^2}$

(17) $y = \frac{6}{\sqrt[4]{x}} = 6x^{-1/4}$, $y' = 6\left(-\frac{1}{4}x^{-5/4}\right) = \frac{-3}{2\sqrt[4]{x^5}}$

(29) $f(x) = \frac{x^4}{6} - 3x$, $f'(x) = \frac{1}{6}(4x^3) - 3(1)$

$= \frac{2x^3}{3} - 3$

$f'(-2) = \frac{2(-2)^3}{3} - 3$

$= -\frac{16}{3} - \frac{9}{3}$

$= -\frac{25}{3}$

31

$y = x^4 - 5x^3 + 2$, $y' = 4x^3 - 5(3x^2) + 0$

$= 4x^3 - 15x^2$

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

$= 32 - 60 = -28$

tangent line

$y - (2^4 - 5 \cdot 2^3 + 2) = -28(x-2)$

$y = -28x + 34$

39

$f(x) = x^3 - 4x^2 - 7x + 8$

$f'(x) = 3x^2 - 8x - 7 = 0 \Rightarrow x = \dfrac{-(-8) \pm \sqrt{(-8)^2 - 4 \cdot 3(-7)}}{2 \cdot 3}$

$= \dfrac{8 \pm \sqrt{64 + 84}}{6}$

$= \dfrac{4}{3} \pm \dfrac{\sqrt{37}}{3}$

45

$g'(2) = 7$, $h'(2) = 14$.

$f(x) = \frac{1}{2} g(x) + \frac{1}{4} h(x)$

$f'(2) = \frac{1}{2} g'(2) + \frac{1}{4} h'(2)$

$= \frac{7}{2} + \frac{14}{4} = 7$

53

$p(q) = \dfrac{1000}{q^2} + 1000$

$R(q) = q \cdot p = \dfrac{1000}{q} + 1000q$

$R'(q) = 1000(-q^{-2}) + 1000$

$= 1000\left(1 - \dfrac{1}{q^2}\right)$

$R'(10) = 1000\left(1 - \dfrac{1}{100}\right)$

$= 990$

73

$s(t) = -16t^2 + 64t$ ft

$s'(t) = -32t + 64$ ft/sec

(a) $s'(2) = 0$, $s'(3) = -32$ ft/sec

(b) $s'(t) = 0 \Rightarrow t = 2$ sec

(c) $s(2) = 64$ ft

$s(t)$ is position at time t,
$s'(t)$ is velocity at time t,
$s'(t) = 0$ happens at the max height
the max height is $s(2)$