Sec 3.1 day 2 p.181 (28-31, 34, 45, 47-52)

(28) $y = x^4 + 2x^2 - x$ $(1, 2)$

$y' = 4x^3 + 4x - 1$

$y'(1) = 4 + 4 - 1 = 7 = m$

$y - 2 = 7(x - 1)$

$\boxed{y = 7x - 5}$

(29) $y = x^4 + 2e^x$ $(0, 2)$

$y' = 4x^3 + 2e^x$

$y'(0) = 2 = m$

tangent $y = 2x + 2$ normal line $y = -\frac{1}{2}x + 2$

(30) $y = (1 + 2x)^2$ $(1, 9)$

$y = 1 + 4x + 4x^2$

$y' = 4 + 8x$

$y'(1) = 4 + 8(1) = 12 = m$

tangent $y - 9 = 12(x - 1)$ or $y = 12x - 3$

Normal $y - 9 = -\frac{1}{12}(x - 1)$ or $y = -\frac{1}{12}x + 9\frac{1}{12}$

(31) $y = 3x^2 - x^3$ $(1, 2)$

$y' = 6x - 3x^2$

$y'(1) = 6 - 3 = 3$

$\boxed{y - 2 = 3(x - 1) \text{ or } y = 3x - 1}$

(45) $s = t^3 - 3t$

a) $v(t) = 3t^2 - 3$

$a(t) = 6t$

$a(1) = 6 \text{ m/s}$

b) $a(2) = 12 \text{ m/s}$

c) $v(t) = 0$ when

$0 = 3t^2 - 3$ so $t = \pm 1$

(47) $S\uparrow$ $S'+$

$S(x) = 5x - e^x$

$S'(x) = 5 - e^x$

$5 - e^x > 0$

$5 > e^x$

$\ln 5 > x$

so $(-\infty, \ln 5)$

(48) $S\cup$ $S''+$

$S(x) = x^3 - 4x^2 + 5x$

$S'(x) = 3x^2 - 8x + 5$

$S''(x) = 6x - 8$

$6x - 8 > 0$ when $x > 4/3$

so $(4/3, \infty)$

(49) hoz tan when $S' = 0$

$S(x) = 2x^3 + 3x^2 - 12x + 1$

$S'(x) = 6x^2 + 6x - 12$

$S'(x) = 6(x^2 + x - 2)$

$0 = 6(x+2)(x-1)$

so $x = -2, x = 1$

points are $(-2, 21)$

$(1, -6)$

(50) $S' = 0$

$f(x) = x^3 + 3x^2 + x + 3$

$S'(x) = 3x^2 + 6x + 1$

$0 = 3x^2 + 6x + 1$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$x \approx -1.8165$

$x \approx -.1835$

(51) $y = 6x^3 + 5x - 3$

$y' = 18x^2 + 5$

$18x^2 + 5 = 4$

$18x^2 = -1$

$\sqrt{x^2} = \sqrt{-1/18}$

is undefined

$\therefore$ y does not have a tangent with 0 slope at $x = 4$.

(52) $y = x^{3/2}$

$y = \frac{3}{2} x^{1/2}$

$m = 3 \qquad 3 = \frac{3}{2} x^{1/2}$

$\sqrt{x} = 2$

$x = 4 \Rightarrow (4, 8)$

$m = 3$

$y - 8 = 3(x - 4)$

or $y = 3x - 4$