2.1/2.2 Tangent Lines

Page 103 #'s 25-33 odd, 34, 37, 39, 42

Page 115 #'s 57-61 odd, 80

25) $f(x) = x^2 + 3$ $(-1, 4)$

$f'(x) = 2x$

$f'(1) = 2$

$y - 4 = 2(x + 1)$

27) $f(x) = x^3$ $(2, 8)$

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

$f'(2) = 12$

$y - 8 = 12(x - 2)$

29) $f(x) = x^{1/2}$ $(1, 1)$

$f'(x) = \frac{1}{2}x^{-1/2}$

$f'(x) = \frac{1}{2\sqrt{x}}$

$f'(1) = \frac{1}{2}$

$y - 1 = \frac{1}{2}(x - 1)$

31) $f(x) = x + 4x^{-1}$ $(-4, -5)$

$f'(x) = 1 - 4x^{-2}$

$f'(x) = 1 - \frac{4}{x^2}$

$f'(-4) = 1 - \frac{4}{16}$

$f'(-4) = \frac{3}{4}$

$y + 5 = \frac{3}{4}(x + 4)$

33) $f(x) = x^2$ $2x - y + 1 = 0$

$f'(x) = 2x$ $y = 2x + 1$

$2 = 2x$

$x = 1$

$f(1) = 1^2$ $(1, 1)$

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

34) $f(x) = 2x^2$ $4x + y + 3 = 0$

$f'(x) = 4x$ $y = -4x - 3$

$-4 = 4x$

$x = -1$

$f(-1) = 2(-1)^2$ $(-1, 2)$

$y - 2 = -4(x + 1)$

37) $f(x) = x^{-1/2}$ $x + 2y - 6 = 0$

$f'(x) = -\frac{1}{2}x^{-3/2}$ $2y = -x + 6$

$f'(x) = \frac{-1}{2\sqrt{x^3}}$ $y = -\frac{1}{2}x + 3$

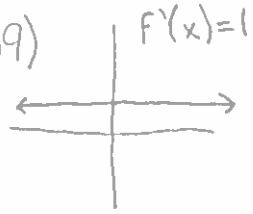
$-\frac{1}{2} = \frac{-1}{2\sqrt{x^3}}$

$\sqrt{x^3} = 1$

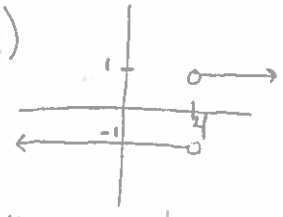
$x = 1$

$f(1) = 1$ $(1, 1)$

$y - 1 = -\frac{1}{2}(x - 1)$

39) 

The slope is always one.

42) 

On the left: slope = -1
On the right: slope = 1

slope DNE at $x=4$
b/c $\lim_{x\to 4^-} f'(x) \neq \lim_{x\to 4^+} f'(x)$

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57) $y = x^4 - 2x^2 + 3$

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

$0 = 4x(x^2-1)$

$x=0 \quad x=1 \quad x=-1$

59) $y = \frac{1}{x^2}$

$y = x^{-2}$

$y' = -2x^{-3}$

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

Has no horizontal tangent

61) $y = x + \sin x$

$y' = 1 + \cos x$

$0 = 1 + \cos x$

$\cos x = -1$

$x = \pi$

80) $f(x) = x^5 + 3x^3 + 5x$

$f'(x) = 5x^4 + 9x^2 + 5$

$3 = 5x^4 + 9x^2 + 5$

$-2 = 5x^4 + 9x^2$

x^4 and x^2 are always positive, so there is no way $-2 = 5x^4 + 9x^2$