Directions: Find the derivative. Use correction symbolism.

35. $f(x) = 2x - 5$

$f'(x) = 2$

36. $y = 3x^2$

$\frac{dy}{dx} = 6x$

37. $g(x) = x^3 - \frac{2}{5}x^2$

$g'(x) = 3x^2 - \frac{4}{5}x$

38. $f(t) = -2t^2 - 3t + 2$

$f'(t) = -4t - 3$

Directions: Differentiate each function. Show steps with correct symbolism.

39. $y = \frac{1}{x} = x^{-1}$

$\frac{dy}{dx} = -x^{-2}$

40. $f(x) = x^2 - \frac{4}{x^2} = x^2 - 4x^{-2}$

$f'(x) = 2x + 8x^{-3}$

41. $y = (2x-1)^2 = 4x^2 + 4x + 1$

$\frac{dy}{dx} = 8x + 4$

42. $y = \frac{\sqrt{x}}{x} = x^{\frac{1}{2}}x^{-1} = x^{-\frac{1}{2}}$

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

43. $g(x) = x(x^2 + 1) = x^3 + x$

$g'(x) = 3x^2 + 1$

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

$\frac{dy}{dx} = \frac{3}{2}x^{\frac{1}{2}} - \frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{2}x^{-\frac{3}{2}}$

Directions: Find the indicated value or expression. Show steps with correct symbolism.

45. $y = 3x^2, y'' =$

$y' = 6x$

$y'' = 6$

46. $f(x) = \sqrt{x} + 2, f'(4) =$

$\lim_{x \to 4} \frac{\sqrt{x} + 2 - 4}{x - 4} = \frac{\sqrt{x} - 2}{x - 4} = \frac{x - 4}{(x-4)(\sqrt{x}+2)}$

$\frac{1}{2+2} = \frac{1}{4}$

47. $\frac{d}{dx}(x^3 + 5) = 3x^2$

48. $f^{(3)}(x) = 2x - 1, f^{(5)}(3) =$

$f^{(3)}(x) = 2$

$f^{(4)}(x) = 0$

$f^{(5)}(3) = 0$

Directions: Find an equation of a line with the following characteristics.

49. Tangent to graph of $f(x) = x^2 - 1$ *at* $(2,3)$

$\lim_{x \to 2} \frac{x^2 - 1 - 4 + 1}{x - 2} = \frac{(x-2)(x+2)}{(x-2)} = 4$

$y - 3 = 4(x - 2)$

50. Tangent to $f(x) = \frac{2}{x}$, *when* $x = 1$

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

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

Directions: Complete each problem below.

51. Find the x-values of all points where the graph of $f(x) = 3x^3 + 2x - 2$ has a slope of 11

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

$11 = 9x^2 + 2$

$0 = 9x^2 - 9$

$0 = 9(x-1)(x+1)$

$x = 1, -1$

52. Find the x-values of all points where the graph of $y = x^4 - 3x^2 + 2$ has a horizontal tangent line

$y' = 4x^3 - 6x$

$0 = 2x(2x^2 - 3)$

$2x^2 = 3$

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

$x = 0, \pm\sqrt{\frac{3}{2}}$

53. Find the x-values of all points where the graph of $y = x^4 - 3x^2 + 2$ has a horizontal tangent line

$y' = 4x^3 - 6x$

$0 = 2x(2x^2 - 3)$

$x = 0, \pm\sqrt{\frac{3}{2}}$

54. Find the average rate of change of the function $f(x) = 3x^3 - 4$ *between* $x = 2$ *and* $x = 4$

$\frac{f(4) - f(2)}{4 - 2} = \frac{188 - 20}{2} = 84$

55. Find the instantaneous rate of change of the function $f(x) = 3x^3 - 4$ *at* $x = 3$

$f'(x) = 9x^2$

$f'(3) = 81$

56. Find the rate of change of $y = \frac{x}{x+2}$ on $[1,4]$

$\frac{\frac{4}{6} - \frac{1}{3}}{3} = \frac{\frac{1}{3}}{3} = \frac{1}{9}$