Find dy/dx

#39. $y = 5x^4 - 3x^3 + 2x^2 + 5x - 9$

$\dfrac{dy}{dx} = 20x^3 - 9x^2 + 4x + 5$

#40. $y = x^{100} + 80x^5 + 16$

$\dfrac{dy}{dx} = 100x^{99} + 400x^4$

#41. $y = (x^3 + 4)(x^3 - x + 1)$

$\dfrac{dy}{dx} = (3x^2)(x^3 - x + 1) + (3x^2 - 1)(x^3 + 4)$

$\dfrac{dy}{dx} = 3x^5 - 3x^3 + 3x^2 + 3x^5 + 12x^2 - x^3 - 4$

$\dfrac{dy}{dx} = 6x^5 - 4x^3 + 15x^2 - 4$

#42. $y = (3x^2 - 5)(x^5 + x^2 - 4x)$

$\dfrac{dy}{dx} = (6x)(x^5 + x^2 - 4x) + (5x^4 + 2x - 4)(3x^2 - 5)$

$\dfrac{dy}{dx} = 6x^6 + 6x^3 - 24x^2 - 13x^2 + 6x^3 + 15x^6 + 20 - 10x - 25x^4$

$\dfrac{dy}{dx} = 21x^6 - 25x^4 + 12x^3 - 36x^2 - 10x + 20$

#43. $y = \dfrac{x^2 + 1}{3x - 4}$

$\dfrac{dy}{dx} = \dfrac{(2x)(3x - 4) - (3)(x^2 + 1)}{(3x - 4)^2}$

$\dfrac{dy}{dx} = \dfrac{6x^2 - 8x - [3x^2 + 3]}{(3x - 4)^2}$

$\dfrac{dy}{dx} = \dfrac{6x^2 - 8x - 3x^2 - 3}{(3x - 4)^2} \qquad \dfrac{dy}{dx} = \dfrac{3x^2 - 8x - 3}{(3x - 4)^2}$

#44 $y = \dfrac{2x - x^2}{3x^4 + 2}$

$\dfrac{dy}{dx} = \dfrac{(2 - 2x)(3x^4 + 2) - (12x^3)(2x - x^2)}{(3x^4 + 2)^2}$

$\dfrac{dy}{dx} = \dfrac{6x^4 + 4 - 6x^5 - 4x - [24x^4 - 12x^5]}{(3x^4 + 2)^2}$

$\dfrac{dy}{dx} = \dfrac{6x^4 + 4 - 6x^5 - 4x - 24x^4 + 12x^5}{(3x^4 + 2)^2}$

$\dfrac{dy}{dx} = \dfrac{6x^5 - 18x^4 - 4x + 4}{(3x^4 + 2)^2}$

#45. $y = (3x^2 - 8)^5$

$\dfrac{dy}{dx} = 5(3x^2 - 8)^4 (6x)$

$\dfrac{dy}{dx} = 30x(3x^2 - 8)^4$

#46. $y = (x^4 + 2x^3 + 7)^{3/4}$

$\dfrac{dy}{dx} = \left(\dfrac{3}{4}\right)(x^4 + 2x^3 + 7)^{\frac{3}{4} - \frac{4}{4}} (4x^3 + 6x^2)$

$*\ \dfrac{dy}{dx} = \left(\dfrac{3}{4}\right)(x^4 + 2x^3 + 7)^{-\frac{1}{4}} (4x^3 + 6x^2)$ 	$\dfrac{18}{4} = \dfrac{9}{2}$

$\dfrac{dy}{dx} = 3x^3 + \dfrac{9}{2}x^2 (x^4 + 2x^3 + 7)^{-\frac{1}{4}}$

#47. $y = \dfrac{1}{(3x + 5)^4}$

$y = (3x + 5)^{-4}$

$\dfrac{dy}{dx} = -4(3x + 5)^{-5} (3)$

$\dfrac{dy}{dx} = \dfrac{-12}{(3x + 5)^5}$

#48 $\quad y = \dfrac{\sqrt{7x^2 - 5}}{(x+3)^2}$

$$y = \dfrac{(7x^2 - 5)^{\frac{1}{2}}}{(x+3)^2}$$

$$\frac{dy}{dx} = \frac{\frac{1}{2}(7x^2-5)^{-\frac{1}{2}}(14x)(x+3)^2 - (2)(x+3)^1(1)(7x^2-5)^{\frac{1}{2}}}{\left((x+3)^2\right)^2}$$

$$\frac{dy}{dx} = \frac{(7x^2-5)^{-\frac{1}{2}}(7x)(x+3)^2 - (2)(x+3)(7x^2-5)^{\frac{1}{2}}}{(x+3)^4}$$

$$\frac{dy}{dx} = \frac{(7x^2-5)^{-\frac{1}{2}}(x+3)\left[(7x)(x+3) - 2(7x^2-5)\right]}{(x+3)^4}$$

$$\frac{dy}{dx} = \frac{(7x^2-5^{-\frac{1}{2}})\left[7x^2 + 21x - 14x^2 - 10\right]}{(x+3)^3}$$

$$\frac{dy}{dx} = \frac{-7x^2 + 21x - 10}{(7x^2-5)^{\frac{1}{2}}(x+3)^3}$$

#49.

$$y = \frac{x\sqrt{2-3x}}{x+5}$$

$$y = \frac{(x)(2-3x)^{1/2}}{(x+5)}$$

$$\frac{dy}{dx} = \frac{\left[(1)(2-3x)^{1/2} + (\frac{1}{2})(2-3x)^{-1/2}(-3)(x) \right](x+5) - (1)(x)(2-3x)^{1/2}}{(x+5)^2}$$

$$\frac{dy}{dx} = \frac{(2-3x)^{1/2}(x+5) + (\frac{1}{2})(2-3x)^{-1/2}(-3x)(x+5) - x(2-3x)^{1/2}}{(x+5)^2}$$

$$\frac{dy}{dx} = \frac{(2-3x)^{-1/2}\left[(2-3x)(x+5) + \frac{3x}{2})(x+5) - x(2-3x)^{1} \right]}{(x+5)^2}$$

$$\frac{dy}{dx} = \frac{(2-3x)^{-1/2}\left[2x + 10 - 3x^2 - 15x \frac{-3x^2}{2} - \frac{15x}{2} - 2x + 3x^2 \right]}{(x+5)^2}$$

$$\frac{dy}{dx} = \frac{+10 - 15x - \frac{3x^2}{2} - \frac{15x}{2}}{(2-3x)^{1/2}(x+5)^2}$$

$$\frac{dy}{dx} = \frac{+\frac{20}{2} - \frac{30x}{2} - \frac{3x^2}{2} - \frac{15x}{2}}{(2-3x)^{1/2}(x+5)^2}$$

$$\frac{dy}{dx} = \frac{20 - 45x - 3x^2}{(2)(2-3x)^{1/2}(x+5)^2}$$

#50 $x^2 - (4x)y^3 + y^2 = 0$

$2x - [(4)(y^3) + 3y^2 y'(4x)] + 2yy' = 0$

$2x - 4y^3 - 12xy^2 y' + 2yy' = 0$

$-12xy^2 y' + 2yy' = -2x + 4y^3$

$y'(-12xy^2 + 2y) = -2x + 4y^3$

$y' = \dfrac{-2x + 4y^3}{-12xy^2 + 2y}$

$y' = \dfrac{2x - 4y^3}{12xy^2 - 2y}$

$y' = \dfrac{-2(-x + 2y^3)}{-2(6xy^2 + y)}$

$y' = \dfrac{2y^3 - x}{y - 6xy^2}$

#51. $y^4 - y^2 = (2x)(y)$

$4y^3 y' - 2yy' = (2)(y) + (1)(y')(2x)$

$4y^3 y' - 2yy' - 2xy' = 2y$

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

$y' = \dfrac{2y}{4y^3 - 2y - 2x}$

$y' = \dfrac{2(y)}{2(2y^3 - y - x)}$

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

#52. $(y^2+1)^3 = 4x^2+3$

$$3(y^2+1)^2(2yy') = 8x$$

$$2yy' = \frac{8x}{(3)(y^2+1)^2}$$

$$y' = \frac{8x}{2y(3)(y^2+1)^2}$$

$$y' = \frac{4x}{3y(y^2+1)^2}$$

#53. $(y+2)^4 = (2x^3-3)^3$

$$4(y+2)^3(1)(y') = 3(2x^3-3)^2(6x^2)$$

$$y' = \frac{(3)(2x^3-3)^2(6x^2)}{(4)(y+2)^3}$$

$$y' = \frac{^{9}(18)(x^2)(2x^3-3)^2}{2(4)(y+2)^3}$$

$$y' = \frac{9x^2(2x^3-3)^2}{2(y+2)^3}$$