

Calculus Worksheet #2 Unit 5 Selected Solutions

The Product Rule :

If $y = uv$ where $u = f(x)$ and $v = g(x)$, then $dy/dx = (u)(dv/dx) + (v)(du/dx)$

$$2. \quad y = (5x - 6)^6(3x + 7)^2$$

$$u = f(x) = (5x - 6)^6 \text{ and } v = g(x) = (3x + 7)^2$$

$$du/dx = 6(5x - 6)^5(5) \quad dv/dx = 2(3x + 7)^1(3)$$

$$du/dx = 30(5x - 6)^5 \quad dv/dx = 6(3x + 7)$$

$$dy/dx = (u) \quad (dv/dx) + (v) \quad (du/dx)$$

$$dy/dx = (5x - 6)^6[6(3x + 7)] + (3x + 7)^2[30(5x - 6)^5]$$

Now factor and simplify.

$$dy/dx = 6(5x - 6)^5(3x + 7)[(5x - 6) + 5(3x + 7)]$$

$$dy/dx = 6(5x - 6)^5(3x + 7)[5x - 6 + 15x + 35]$$

$$dy/dx = 6(5x - 6)^5(3x + 7)(20x + 29)$$

$$4. \quad y = (6x + 5)(x^2 + 9)^5$$

$$u = f(x) = 6x + 5 \text{ and } v = g(x) = (x^2 + 9)^5$$

$$du/dx = 6 \quad dv/dx = 5(x^2 + 9)^4(2x)$$

$$du/dx = 6 \quad dv/dx = 10x(x^2 + 9)^4$$

$$dy/dx = (u) \quad (dv/dx) + (v) \quad (du/dx)$$

$$dy/dx = (6x + 5)[10x(x^2 + 9)^4] + (x^2 + 9)^5 [6]$$

$$dy/dx = 2(x^2 + 9)^4[5x(6x + 5) + 3(x^2 + 9)]$$

$$dy/dx = 2(x^2 + 9)^4[30x^2 + 25x + 3x^2 + 27]$$

$$dy/dx = 2(x^2 + 9)^4[33x^2 + 25x + 27]$$

The Quotient Rule:

If $y = \frac{u}{v}$, where $u = f(x)$ and $v = g(x)$, then $dy/dx = \frac{(v)(du/dx) - (u)(dv/dx)}{v^2}$

$$6. \quad y = \frac{2x + 3}{3x - 1}$$

$$u = f(x) = 2x + 3 \text{ and } v = g(x) = 3x - 1$$

$$du/dx = 2 \quad dv/dx = 3$$

$$dy/dx = \frac{(v)(du/dx) - (u)(dv/dx)}{v^2}$$

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

$$dy/dx = \frac{6x - 2 - 6x - 9}{(3x - 1)^2}$$

$$dy/dx = \frac{-11}{(3x - 1)^2}$$

$$9. \quad y = \frac{x^2 + 1}{x^2 - 2}$$

$$u = f(x) = x^2 + 1 \text{ and } v = g(x) = x^2 - 2$$

$$du/dx = 2x \quad dv/dx = 2x$$

$$dy/dx = \frac{(v)(du/dx) - (u)(dv/dx)}{v^2}$$

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

$$dy/dx = \frac{2x^3 - 4x - 2x^3 - 2x}{(x^2 - 2)^2}$$

$$dy/dx = \frac{-6x}{(x^2 - 2)^2}$$