

Calculus Worksheet #2 Unit 4 Selected Solutions

Find the general solution and the specific solution to each of the following differential equations. Show your work **neatly organized**.

7. $f'(x) = x^2 - 3x - 1$; $f(3) = 0$

$$f(x) = \int (x^2 - 3x - 1) dx$$

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

$$f(3) = 9 - 13.5 - 3 + C = 0$$

$$C - 7.5 = 0$$

$$C = 7.5$$

$$f(x) = \frac{1}{3}x^3 - \frac{3}{2}x^2 - x + \frac{15}{2}$$

10. $f''(x) = 12x$; $f(2) = 2$; $f(-1) = 5$

$$f'(x) = \int (12x) dx = 6x^2 + C_1$$

$$f(x) = \int (6x^2 + C_1) dx$$

$$f(x) = 3x^3 + C_1x + C_2$$

$$f(2) = 24 + 2C_1 + C_2 = 2$$

$$f(-1) = -3 - C_1 + C_2 = 5$$

$$2C_1 + C_2 = -22 \quad C_1 = -10$$

$$-C_1 + C_2 = 8 \quad C_2 = -2$$

$$f(x) = 3x^3 - 10x - 2$$

13. The slope, m , of the curve at any point (x, y) on the curve is given by the equation $m = 6x^2 - 5$. The curve has an x -intercept of -1 .

$$y = f(x)$$

$$m = f'(x) = 6x^2 - 5$$

$$f(x) = \int (6x^2 - 5) dx$$

$$f(x) = 2x^3 - 5x + C$$

The x -intercept is -1 .

$$f(-1) = 0$$

$$f(-1) = -2 + 5 + C = 0$$

$$C + 3 = 0$$

$$C = -3$$

$$f(x) = 2x^3 - 5x - 3$$