Calculus   Worksheet #1   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. $f'(x) = 2x^2 + 8x + 2$; $f(-6) = 1$

$$f(x) = \int (2x^2 + 8x + 2)dx$$

$$\boxed{f(x) = \tfrac{2}{3}x^3 + 4x^2 + 2x + C}$$

$$f(-6) = -144 + 144 - 12 + C = 1$$

$$C - 12 = 1$$

$$C = 13$$

$$\boxed{f(x) = \tfrac{2}{3}x^3 + 4x^2 + 2x + 13}$$

11. $f''(x) = 3x - 2$; $f(2) = 3$; $f(-2) = -1$

$$f'(x) = \int (3x - 2)dx = \tfrac{3}{2}x^2 - 2x + C_1$$

$$f(x) = \int (\tfrac{3}{2}x^2 - 2x + C_1)dx$$

$$\boxed{f(x) = \tfrac{1}{2}x^3 - x^2 + C_1 x + C_2}$$

$$f(2) = 4 - 4 + 2C_1 + C_2 = 3$$

$$f(-2) = -4 - 4 - 2C_1 + C_2 = -1$$

$$2C_1 + C_2 = 3 \qquad C_1 = -1$$

$$-2C_1 + C_2 = 7 \qquad C_2 = 5$$

$$\boxed{f(x) = \tfrac{1}{2}x^3 - x^2 - x + 5}$$

13. The slope, m, of a particular curve at any point (x, y) on the curve is given by the equation m = -2x + 1. Find the equation of the curve if it has a y-intercept of 10.

$$y = f(x)$$

$$m = f'(x) = -2x + 1$$

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

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

The y-intercept is 10.

$$f(0) = C = 10$$

$$\boxed{y = f(x) = -x^2 + x + 10}$$