

1. Determine the rate of change of the given function over the given interval:

$$f(x) = \frac{2x}{1 - 2x + 2x^2} \quad \text{over} \quad [-4, -2]$$

2. Determine the rate of change of the given function over the given interval:

$$f(x) = +2x + 2 + \frac{-2}{x} + \frac{2}{x^2} \quad \text{over} \quad [-3, -2]$$

3. Determine the rate of change of the given function over the given interval:

$$f(x) = \frac{1 - x}{3 + 2x} \quad \text{over} \quad [-4, -2]$$

4. Determine the rate of change of the given function over the given interval:

$$f(x) = -2 + 2x + x^2 - 3x^3 \quad \text{over} \quad [-3, 1]$$

5. Determine the rate of change of the given function over the given interval:

$$f(x) = \frac{-2x}{2 + 2x - 2x^2} \quad \text{over} \quad [-4, -1]$$

6. Determine the rate of change of the given function over the given interval:

$$f(x) = \sqrt{2x + 3x^2 - x^3} \quad \text{over} \quad [-3, 1]$$

7. Determine the rate of change of the given function over the given interval:

$$f(x) = \sqrt{3 - 3x + 3x^2 - 3x^3} \quad \text{over} \quad [-1, 0]$$

8. Determine the rate of change of the given function over the given interval:

$$f(x) = \sqrt{3 - 3x - 2x^2 + 2x^3} \quad \text{over} \quad [0, 2]$$

9. Determine the rate of change of the given function over the given interval:

$$f(x) = \frac{3 + x}{-1 + 2x} \quad \text{over} \quad [-3, -2]$$

10. Determine the rate of change of the given function over the given interval:

$$f(x) = -x - 2x^2 - 2x^3 \quad \text{over} \quad [-1, 2]$$

Answers: 1. -0.056 2. 2.611 3. -1 4. -21 5. -0.263 6. -1.232 7. -1.732 8. 0.252 9. -0.200 10. -9

Solutions:

1.

$$x_1 = -4 \quad f(x_1) = \frac{2(-4)}{1 - 2(-4) + 2(-4)^2} = -0.19512195121951$$

$$x_2 = -2 \quad f(x_2) = \frac{2(-2)}{1 - 2(-2) + 2(-2)^2} = -0.30769230769231$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{-0.30769230769231 - (-0.19512195121951)}{-2 - (-4)} = -0.056$$

2.

$$x_1 = -3 \quad f(x_1) = +2(-3) + 2 + \frac{-2}{(-3)} + \frac{2}{(-3)^2} = -3.11111111111111$$

$$x_2 = -2 \quad f(x_2) = +2(-2) + 2 + \frac{-2}{(-2)} + \frac{2}{(-2)^2} = -0.5$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{-0.5 - (-3.11111111111111)}{-2 - (-3)} = 2.611$$

3.

$$x_1 = -4 \quad f(x_1) = \frac{1 - (-4)}{3 + 2(-4)} = -1$$

$$x_2 = -2 \quad f(x_2) = \frac{1 - (-2)}{3 + 2(-2)} = -3$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{-3 - (-1)}{-2 - (-4)} = -1$$

4.

$$x_1 = -3 \quad f(x_1) = -2 + 2(-3) + (-3)^2 - 3(-3)^3 = 82$$

$$x_2 = 1 \quad f(x_2) = -2 + 2(1) + (1)^2 - 3(1)^3 = -2$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{-2 - (82)}{1 - (-3)} = -21$$

5.

$$x_1 = -4 \quad f(x_1) = \frac{-2(-4)}{2 + 2(-4) - 2(-4)^2} = -0.21052631578947$$

$$x_2 = -1 \quad f(x_2) = \frac{-2(-1)}{2 + 2(-1) - 2(-1)^2} = -1$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{-1 - (-0.21052631578947)}{-1 - (-4)} = -0.263$$

6.

$$x_1 = -3 \quad f(x_1) = \sqrt{2(-3) + 3(-3)^2 - (-3)^3} = 6.9282032302755$$

$$x_2 = 1 \quad f(x_2) = \sqrt{2(1) + 3(1)^2 - (1)^3} = 2$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{2 - (6.9282032302755)}{1 - (-3)} = -1.232$$

7.

$$x_1 = -1 \quad f(x_1) = \sqrt{3 - 3(-1) + 3(-1)^2 - 3(-1)^3} = 3.4641016151378$$

$$x_2 = 0 \quad f(x_2) = \sqrt{3 - 3(0) + 3(0)^2 - 3(0)^3} = 1.7320508075689$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{1.7320508075689 - (3.4641016151378)}{0 - (-1)} = -1.732$$

8.

$$x_1 = 0 \quad f(x_1) = \sqrt{3 - 3(0) - 2(0)^2 + 2(0)^3} = 1.7320508075689$$

$$x_2 = 2 \quad f(x_2) = \sqrt{3 - 3(2) - 2(2)^2 + 2(2)^3} = 2.2360679774998$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{2.2360679774998 - (1.7320508075689)}{2 - (0)} = 0.252$$

9.

$$x_1 = -3 \quad f(x_1) = \frac{3 + (-3)}{-1 + 2(-3)} = 0$$

$$x_2 = -2 \quad f(x_2) = \frac{3 + (-2)}{-1 + 2(-2)} = -0.2$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{-0.2 - (0)}{-2 - (-3)} = -0.200$$

10.

$$x_1 = -1 \quad f(x_1) = -(-1) - 2(-1)^2 - 2(-1)^3 = 1$$

$$x_2 = 2 \quad f(x_2) = -(2) - 2(2)^2 - 2(2)^3 = -26$$

$$RC = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{-26 - (1)}{2 - (-1)} = -9$$