

for each of the following functions, determine the average rate of change in the value of y in moving from $x = -1$ to $x = 2$

1) $y = f(x) = 3x^2$

$$f(-1) = 3(-1)^2 = 3$$

$$f(2) = 3(2)^2 = 12$$

$$\Delta x = 2 - (-1) = 3$$

$$\frac{\Delta y}{\Delta x} = \frac{f(x_2) - f(x_1)}{\Delta x}$$

$$= \frac{12 - 3}{3}$$

$$= \frac{9}{3} = 3$$

$$\Delta y / \Delta x = 3$$

2) $y = f(x) = 5x^3$ from $x = -1$ to $x = 2$

$$f(-1) = 5(-1)^3 = -5$$

$$f(2) = 5(2)^3 = 5(8) = 40$$

$$\Delta x = x_2 - x_1 = 2 - (-1) = 3$$

$$\frac{\Delta y}{\Delta x} = \frac{f(x_2) - f(x_1)}{\Delta x}$$

$$= \frac{40 - (-5)}{3} = \frac{45}{3} = 15$$

$$\frac{\Delta y}{\Delta x} = 15$$

$$3) \quad Y = f(x) = x^2 - 2x + 3 \quad \text{from } x = -1 \text{ to } x = 2$$

$$f(-1) = (-1)^2 - 2(-1) + 3$$

$$= 1 + 2 + 3 = 6$$

$$f(2) = (2)^2 - 2(2) + 3$$

$$= 4 - 4 + 3 = 3$$

$$\Delta x = x_2 - x_1 = 2 - (-1) = 3$$

$$\frac{\Delta Y}{\Delta x} = \frac{f(x_2) - f(x_1)}{\Delta x}$$

$$= \frac{3 - 6}{3} = \frac{-3}{3} = -1$$

$$\Delta Y / \Delta x = -1$$

$$4) \quad Y = f(x) = x^3 - 2x^2 + x + 2$$

$$f(-1) = (-1)^3 - 2(-1)^2 + (-1) + 2$$

$$= -1 - 2 - 1 + 2$$

$$= -2$$

$$f(2) = (2)^3 - 2(2)^2 + 2 + 2$$

$$= 8 - 8 + 2 + 2$$

$$= 4$$

$$\Delta x = x_2 - x_1 = 2 - (-1) = 3$$

$$\frac{\Delta Y}{\Delta x} = \frac{f(x_2) - f(x_1)}{\Delta x}$$

$$= \frac{4 - (-2)}{3} = \frac{4 + 2}{3} = \frac{6}{3}$$

$$\frac{\Delta Y}{\Delta x} = 2$$

$$\textcircled{10} \quad y = f(u) = -x^2 + 2x + 4$$

$$\begin{aligned} y = f(-1) &= -(-1)^2 + 2(-1) + 4 \\ &= -(1) - 2 + 4 \\ &= 1 \end{aligned}$$

$$\begin{aligned} y = f(2) &= -(2)^2 + 2(2) + 4 \\ &= -(4) + 4 + 4 \\ &= 4 \end{aligned}$$

$$\begin{aligned} \Delta u &= x_2 - x_1 \\ &= 2 - (-1) = 3 \end{aligned}$$

$$\begin{aligned} \frac{\Delta y}{\Delta u} &= \frac{f(x)_2 - f(x)_1}{\Delta u} \\ &= \frac{4 - 1}{3} \\ &= \frac{3}{3} = \underline{\underline{1}} \text{ Ans} \end{aligned}$$

$$\textcircled{14} \quad y = f(u) = x^4 - 10$$

$$\begin{aligned} y = f(-1) &= (-1)^4 - 10 \\ &= 1 - 10 \\ &= -9 \end{aligned}$$

$$\begin{aligned} y = f(2) &= (2)^4 - 10 \\ &= 16 - 10 \\ &= 6 \end{aligned}$$

$$\Delta u = 3$$

$$\begin{aligned} \frac{\Delta y}{\Delta u} &= \frac{f(u_2) - f(u_1)}{\Delta u} \\ &= \frac{6 - (-9)}{3} \\ &= \frac{6 + 9}{3} \\ &= \frac{15}{3} \\ &= \underline{\underline{5}} \text{ Ans} \end{aligned}$$

$$(16) \quad h(t) = 576 - 16t^2$$

$$\textcircled{a} \quad t_1 = 0 \quad t_2 = 1$$

$$\begin{aligned} \Delta t &= t_2 - t_1 \\ &= 1 - 0 \\ &= 1 \end{aligned}$$

$$\begin{aligned} h(0) &= 576 - 16(0)^2 \\ &= 576 \end{aligned}$$

$$\begin{aligned} h(1) &= 576 - 16(1)^2 \\ &= 576 - 16 \\ &= 560 \end{aligned}$$

$$\frac{\Delta h}{\Delta t} = \frac{h(t_2) - h(t_1)}{\Delta t}$$

$$= \frac{560 - 576}{1}$$

$$= -16 \text{ ft/sec}$$

$$\textcircled{b} \quad t_1 = 0 \quad t_2 = 2$$

$$\begin{aligned} \Delta t &= t_2 - t_1 \\ &= 2 - 0 \\ &= 2 \end{aligned}$$

$$\begin{aligned} h(0) &= 576 - 16(0)^2 \\ &= 576 \end{aligned}$$

$$\begin{aligned} h(2) &= 576 - 16(2)^2 \\ &= 576 - 64 \\ &= 512 \end{aligned}$$

$$\frac{\Delta h}{\Delta t} = \frac{512 - 576}{2}$$

$$= -64/2$$

$$= -32 \text{ ft/sec}$$

$$\textcircled{c} \quad t_1 = 0 \quad t_2 = 4$$

$$\Delta t = 4$$

$$h(0) = 576$$

$$\begin{aligned} h(4) &= 576 - 16(4)^2 \\ &= 576 - 256 \end{aligned}$$

$$= 320$$

$$\frac{\Delta h}{\Delta t} = \frac{320 - 576}{4}$$

$$= -256/4$$

$$= -64 \text{ ft/sec}$$