

MAC 2233

1. $g(t) = \frac{t+4}{t-1} \quad 2 \leq t \leq 5$

$$g(2) = \frac{2+4}{2-1} = \frac{6}{1} = 6$$

$$g(5) = \frac{5+4}{5-1} = \frac{9}{4}$$

$$\text{Average rate of change} = \frac{g(5) - g(2)}{5 - 2}$$

$$= \frac{\frac{9}{4} - 6}{5 - 2}$$

$$\frac{\frac{9}{4} - 6}{1} = \frac{9 - 24}{4} = -\frac{15}{4}$$

$$-\frac{15}{4} \div 3 = -\frac{15}{4} \times \frac{1}{3} = -\frac{5}{4}$$

Answer $-\frac{5}{4}$ or -1.25 .

$$f(x) = 2\sqrt{x}$$

$$2. f(x) = 2\sqrt{x}$$

$$\frac{f(x+h) - f(x)}{h}$$

$$f(x+h) = 2\sqrt{x+h} \quad f(x) = 2\sqrt{x}$$

$$\frac{f(x+h) - f(x)}{h} = \frac{2\sqrt{x+h} - 2\sqrt{x}}{h}$$

$$= \frac{2(-\sqrt{x} + \sqrt{x+h})}{h}$$

$$\frac{f(x+h) - f(x)}{h} = \frac{2(-\sqrt{x} + \sqrt{x+h})}{h}$$

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{2(-\sqrt{x} + \sqrt{x+h})}{h}$$

$$= 2 \lim_{h \rightarrow 0} \frac{-\sqrt{x} + \sqrt{x+h}}{h}$$

$$\frac{-\sqrt{x} + \sqrt{x+h}}{h} \times \frac{\sqrt{x} + \sqrt{x+h}}{\sqrt{x} + \sqrt{x+h}}$$

$$= 2 \lim_{h \rightarrow 0} \left(\frac{h}{\sqrt{x} + \sqrt{x+h}} \right)$$

$$= 2 \lim_{h \rightarrow 0} \frac{1}{\sqrt{x} + \sqrt{x+h}}$$

$$= 2 \cdot \frac{1}{\sqrt{x} + \sqrt{x+0}} = 2 \cdot \frac{1}{\sqrt{x} + \sqrt{x}}$$

$$= 2 \cdot \frac{1}{2\sqrt{x}} = \frac{1}{\sqrt{x}}$$

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \frac{1}{\sqrt{x}}$$

$$3. f(x) = 1 - 8x - 6x^2.$$

$$f(0) = 1 - 8(0) - 6(0)^2.$$

$$f(0) = 1.$$

$$M = \frac{\Delta y}{\Delta x} = \frac{f(0) - f(x)}{0 - x}.$$

$$M = \frac{1 - (1 - 8x - 6x^2)}{0 - x}$$

$$= \frac{1 - 1 + 8x + 6x^2}{-x} = \frac{8x + 6x^2}{-x}$$

$$= -8 - 6x$$

MAR 2022

Instantaneous rate of change

at $x=0$ is

$$\lim_{x \rightarrow 0} M = \lim_{x \rightarrow 0} -8 - 6x$$

$$= \underline{\underline{-8}}$$

$$f. f(x) = a(x-h)^2 + k$$

$$(h, k) = (0, 2)$$

$$f(x) = a(x-0)^2 + 2$$

$$(1, 1)$$

$$f(1) = a(1)^2 + 2$$

$$1 = a + 2$$

$$a = 1 - 2$$

$$a = -1$$

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

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

$$f'(x) = -2x$$

$$f'(1) = -2(1)$$

$$f'(1) = -2$$

$$(1, 1) (0, 3) \quad \text{equ. of tangent.}$$

$$M = \frac{3-1}{0-1} = \frac{2}{-1} = -2$$

$$\frac{-2}{1} = \frac{y-3}{x}$$

$$y-3 = -2x$$

$$y = -2x + 3$$