

## Math 101 Quiz # 3

Name: Solution I.D. # \_\_\_\_\_ Section # \_\_\_\_\_ Serial # \_\_\_\_\_

1. Use the definition find
- $f'(x)$
- if
- $f(x) = \frac{1}{x+4}$

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{\frac{1}{x+h+4} - \frac{1}{x+4}}{h} \\ &= \lim_{h \rightarrow 0} \frac{\cancel{x+4} - \cancel{x} - h - 4}{(x+h+4)(x+4)} \\ &= \lim_{h \rightarrow 0} \frac{-h}{h(x+h+4)(x+4)} = \lim_{h \rightarrow 0} \frac{-1}{(x+h+4)(x+4)} = \frac{-1}{(x+4)^2} \end{aligned}$$

2. Find
- $\frac{dy}{dx}$
- for each of the following:

i)  $y = x\left(\frac{1+x^3}{2-x}\right)$

$$y = \frac{(x+x^4)}{2-x}$$

$$\begin{aligned} \frac{dy}{dx} &= \frac{(2-x)(1+4x^3) - (x+x^4)(-1)}{(2-x)^2} \\ &= \frac{-4x^4 + 8x^3 - x + 2 + x + x^4}{(2-x)^2} \\ &= \frac{-3x^4 + 8x^3 + 2}{(2-x)^2} \end{aligned}$$

ii)  $y = \frac{\sqrt{\pi}}{2}$

$$\frac{dy}{dx} = 0$$

3. Find
- $y'''$
- at
- $x = -1$
- if
- $y = x^{-4} + x$

$$y' = -4x^{-5}$$

$$y'' = 20x^{-6}$$

$$y''' = -120x^{-7} = -\frac{120}{x^7}$$

$$y''' \Big|_{x=-1} = 120$$

$$x = -1$$