

## Math 101 Quiz # 3

Name: Solution I.D. # \_\_\_\_\_ Section # \_\_\_\_\_ Serial # \_\_\_\_\_1. Use the definition find  $f'(x)$  if  $f(x) = \frac{1}{x+3}$ 

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{\frac{1}{x+h+3} - \frac{1}{x+3}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\frac{x+3 - x-h-3}{(x+h+3)(x+3)}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{-h}{h(x+h+3)(x+3)} = \lim_{h \rightarrow 0} \frac{-1}{(x+h+3)(x+3)} = -\frac{1}{(x+3)^2}$$

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

i)  $y = x(1+x^3)^3$

$$\begin{aligned} \frac{dy}{dx} &= x[3(1+x^3)^2(3x^2)] + (1+x^3)^3 \\ &= 9x^3(1+x^3)^2 + (1+x^3)^3 \\ &= (1+x^3)^2[9x^3 + 1+x^3] \\ &= (1+x^3)^2(10x^3+1) \end{aligned}$$

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