

For full credit you must (NEATLY) show your work. Partial credit may be given for incorrect solutions if sufficient work is shown.

1. (6 pts) Use the four-step process to find  $f'(x)$  for  $f(x) = x^2 + 1$ .

$$\bullet f(x+h) = (x+h)^2 + 1 \\ = x^2 + 2xh + h^2 + 1$$

$$\bullet f(x+h) - f(x) = x^2 + 2xh + h^2 + 1 - (x^2 + 1) \\ = 2xh + h^2$$

$$\bullet \frac{f(x+h) - f(x)}{h} = \frac{2xh + h^2}{h} = 2x + h$$

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

2. (2 pts) Find the equation of the tangent line to  $f(x) = x^2 + 1$  at  $x = 3$ .

Point:  $x_0 = 3, y_0 = f(3) = 3^2 + 1 = 10$

Slope:  $f'(3) = 2(3) = 6$

Eqn:  $\boxed{y - 10 = 6(x - 3)} \iff y = 6x - 8$

3. (2 pt) Use any method to evaluate

$$\frac{d}{dx} \left( 5x^4 - 8x + \frac{1}{x} \right) = \boxed{20x^3 - 8 - x^{-2}}$$

$\downarrow$   
 $= x^{-1}$