

Name: _____

Quiz 1, review

1. (4 pts) Let $f(x) = x^3$. Evaluate the following.

$$\text{a) Expand this using the binomial theorem: } f(x+h) = (x+h)^3$$

$$= \binom{3}{0} x^3 h^0 + \binom{3}{1} x^2 h + \binom{3}{2} x h^2 + \binom{3}{3} x^0 h^3$$

$$= x^3 + 3x^2 h + 3x h^2 + h^3$$

← you can go straight to this step

b) Now subtract $f(x)$ to get $J = f(x+h) - f(x)$ in simplest terms.

$$J = (x^3 + 3x^2 h + 3x h^2 + h^3) - (x^3)$$

$$= 3x^2 h + 3x h^2 + h^3$$

c) Now divide by h to get $K = \frac{f(x+h) - f(x)}{h}$ in simplest terms.

$$K = \frac{3x^2 h + 3x h^2 + h^3}{h} = 3x^2 + 3x h + h^2$$

$$= \frac{h(3x^2 + 3x h + h^2)}{h}$$

2. (4 pts) Let $f(x) = \sqrt{x}$. Evaluate the following.a) Write $J = f(x+h) - f(x)$. Multiply top and bottom by the conjugate to get a fraction.

Simplify the numerator but not the denominator.

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

$$= \frac{h}{\sqrt{x+h} + \sqrt{x}}$$

b) Now divide by h to get $K = \frac{f(x+h) - f(x)}{h}$ in simplest terms.

$$\frac{1}{h} \left(\frac{h}{\sqrt{x+h} + \sqrt{x}} \right) = \frac{1}{\sqrt{x+h} + \sqrt{x}}$$

$$3. (2 \text{ pts}) \text{ Simplify } A = \frac{x^2 - x - 12}{x + 3} = \frac{(x+3)(x-4)}{x+3} = x - 4$$