

WRITE YOUR NAME:

MAC 2311 Homework 1

Due in class, Friday January 20th

You can use more paper if necessary, but please STAPLE

Question 1. If $f(x) = x^2$, find and simplify each of the following.

• $f(7)$

• $f(-7)$

• $f(7.02)$

• $f(7+h)$

• $f(7)+h$

• $f(7) = 7^2 = 49$

• $f(-7) = (-7)^2 = 49$

• $f(7.02) = (7.02)^2 = 49.2804$

• $f(7+h) = (7+h)^2 = (7+h)(7+h)$
 $= 49 + 14h + h^2$

• $f(7)+h = 7^2 + h = 49 + h$

$$\begin{array}{r} 702 \\ \times 702 \\ \hline 1404 \\ 4914 \\ \hline 492804 \end{array}$$

Question 2. Expand and simplify each of the following.

- $(a-b)(a+b)$

- $(\sqrt{x+h}-\sqrt{x})(\sqrt{x+h}+\sqrt{x})$

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

- $(a-b)(a+b) = a^2 - b^2$

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

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

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

Question 3. Evaluate the limit. (Hint: Do some algebra.)

$$\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$$

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

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

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

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