

You must show all your work to receive credit. Calculators are allowed.

Problem 1: (4 points) Find the domains of the functions

$$f(x) = \frac{x+2}{x^2+5x+6}, \quad g(x) = \sqrt{x-2} + \sqrt{9-x}.$$

division by 0 when $x^2+5x+6=0$
 $(x+3)(x+2)=0$

Need $x \geq 2$ and $x \leq 9$

so domain of $g = \{2 \leq x \leq 9\}$

so domain of $f = \mathbb{R} - \{-3, -2\}$

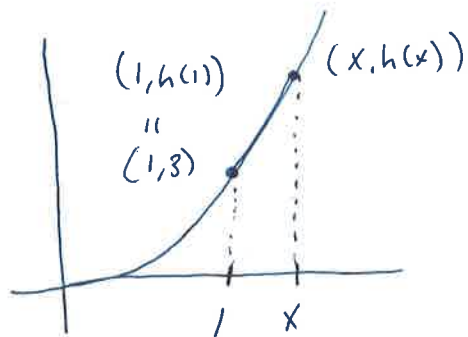
$= [2, 9]$

Problem 2: (3 points) Let $h(x) = x^2 + 2x$. Find and simplify

$$\frac{h(x) - h(1)}{x - 1}$$

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

Problem 3: (3 points) Using the methods discussed in class, find the slope of the line tangent to the graph of $h(x) = x^2 + 2x$ at $x = 1$. Hint: You may use your answer from Problem 2.



$$\text{slope of secant line} = \frac{h(x) - h(1)}{x - 1} = x + 3$$

$$\text{slope of tangent line} = \lim_{x \rightarrow 1} (\text{slope of secant line})$$

$$= \lim_{x \rightarrow 1} (x + 3) = 4$$