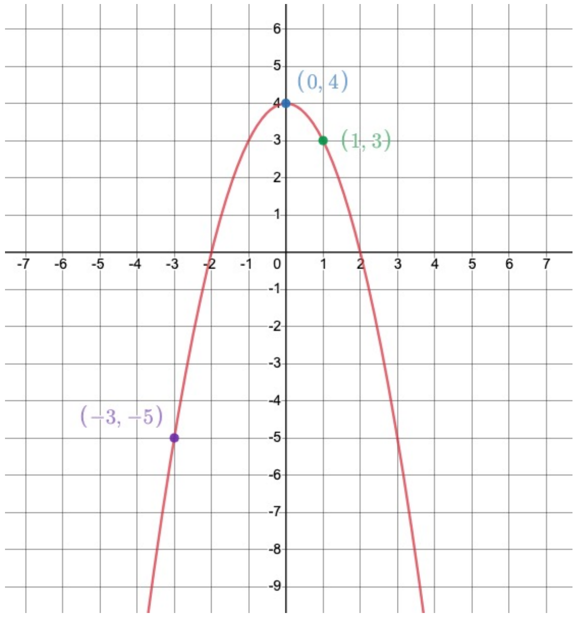
Mathematics 1375, Fall 2020 **Quiz #2**
Instructor: Suman Ganguli **Due: Friday, October 2** **Name:** ____________________

1. (10 points) Shown below is the graph of the function $f(x) = -x^2 + 4$:



(a) Compute the following values of f (show your calculations), and label the corresponding points on the graph above:

Solution:

- $f(0) = -0^2 + 4 = 0 + 4 = 4$ (which means the point $(0, 4)$ is on the graph)
- $f(1) = -(1^2) + 4 = -1 + 4 = 3$ (so the point $(1, 3)$ is on the graph)
- $f(-3) = -(3^2) + 4 = -9 + 4 = -5$ (so the point $(-3, -5)$ is on the graph)

(b) What is the domain of f? What is the range of f? Write the solutions in interval notation:

Solution:

- The domain of f is $\mathbb{R}$, i.e., all real numbers; in interval notation: $(-\infty, \infty)$
- Since the max value of $f(x)$ is $f(0) = 4$ the range of f is $(-\infty, 4]$

2. (4 points) Find the domain of each of the following functions. Show the necessary calculations, and write the solutions in interval notation:

   (a)

$$g(x) = \frac{1}{x-2}$$

Solution: The domain consists of all real numbers *except* $x = 2$, i.e., in interval notation: $(-\infty, 2) \cup (2, \infty)$

   (b)

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

Solution: The domain consists of real numbers x such that $x + 1 \geq 0$, i.e., in $x \geq -1$. In interval notation: $[-1, \infty)$

3. (6 points) Let $f(x) = 2x^2 - 3x + 1$.

   (a) Compute and simplify:

$$f(x+h) =$$

Solution: $f(x+h) = 2(x+h)^2 - 3(x+h) + 1 = 2(x^2 + 2xh + h^2) - 3x - 3h + 1 = 2x^2 + 4xh + 2h^2 - 3x - 3h + 1$

   (b) Next, compute and simplify:

$$f(x+h) - f(x) =$$

Solution: $f(x+h) - f(x) = (2x^2 + 4xh + 2h^2 - 3x - 3h + 1) - (2x^2 - 3x + 1) = 4xh + 2h^2 - 3h$

   (c) Finally, compute and simplify the difference quotient:

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

Solution:

$$\frac{f(x+h) - f(x)}{h} = \frac{4xh + 2h^2 - 3h}{h} = 4x + 2h - 3$$