This exam contains 8 pages and 9 problems. Check to see if any pages are missing. Print your name on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may use a calculator on this exam. No other aids are allowed.

Show all your work in the space provided. One point for each question will be awarded for *style* unless otherwise indicated.
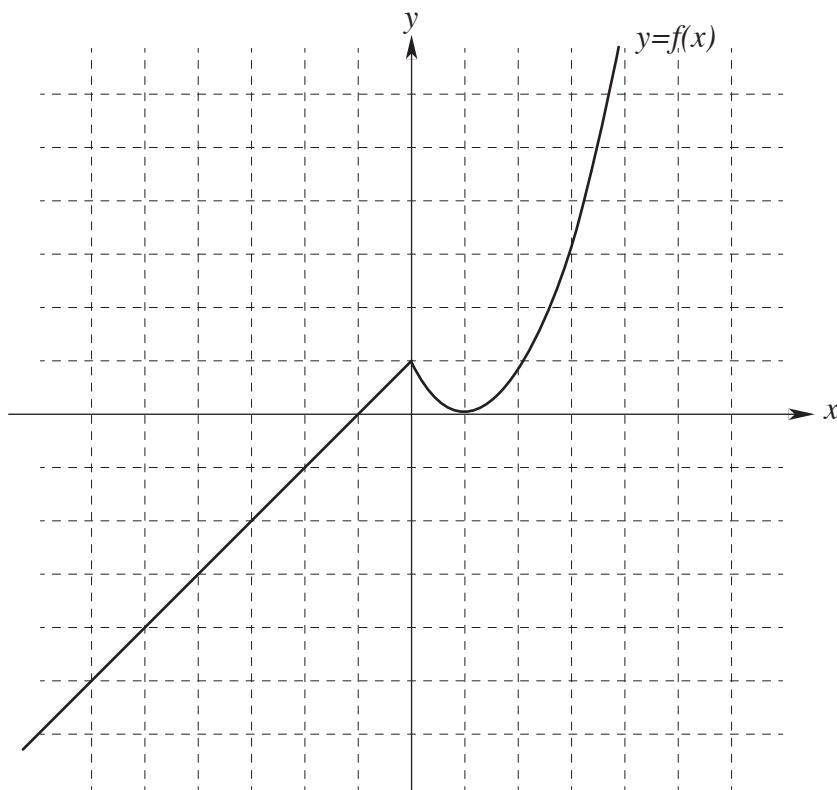
Total: 50 points

Before you begin, please appreciate this joke (found on Reddit):
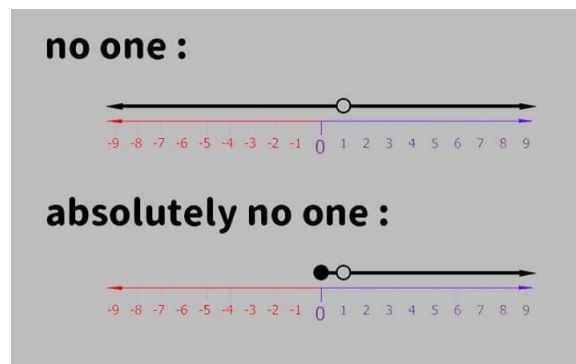
1. (5 points) Solve the inequality. Write your solution set in interval notation.

$$|5x - 2| \geq 3$$

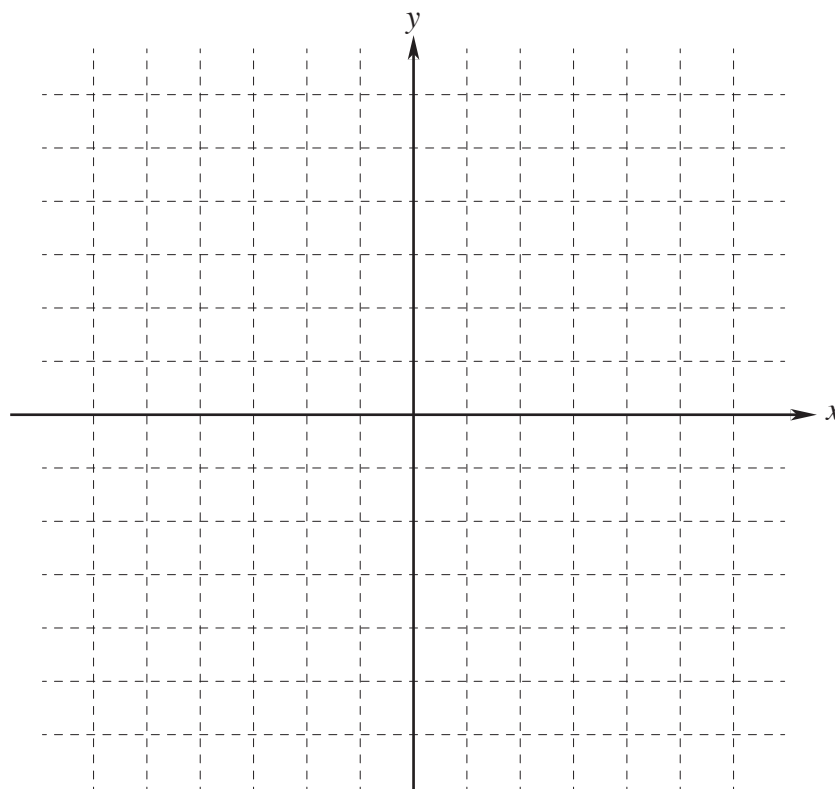2. (5 points) Let $f(x)$ be the function with the following graph (scale: each box $= 1$ square unit).

Determine the following (you do not need to explain your answers):

(a) The domain of $f(x)$

(b) The range of $f(x)$

(c) $f(0)$

(d) $f(2)$

(e) $f(-2)$

3. (5 points) Graph the function (scale: each box $= 1$ square unit).

$$f(x) = -(x-1)^2 + 2$$

Find the exact coordinates of x-intercepts (if any), y-intercepts (if any), and any maxima or minima. Do not approximate your answers. Show your work below and label these points on your graph.

4. (5 points) Let

$$f(x) = \begin{cases} x & x \leq 0 \\ x^2 & x > 1 \end{cases}$$

Determine the following (you do not need to explain your answers):

(a) The domain of $f(x)$
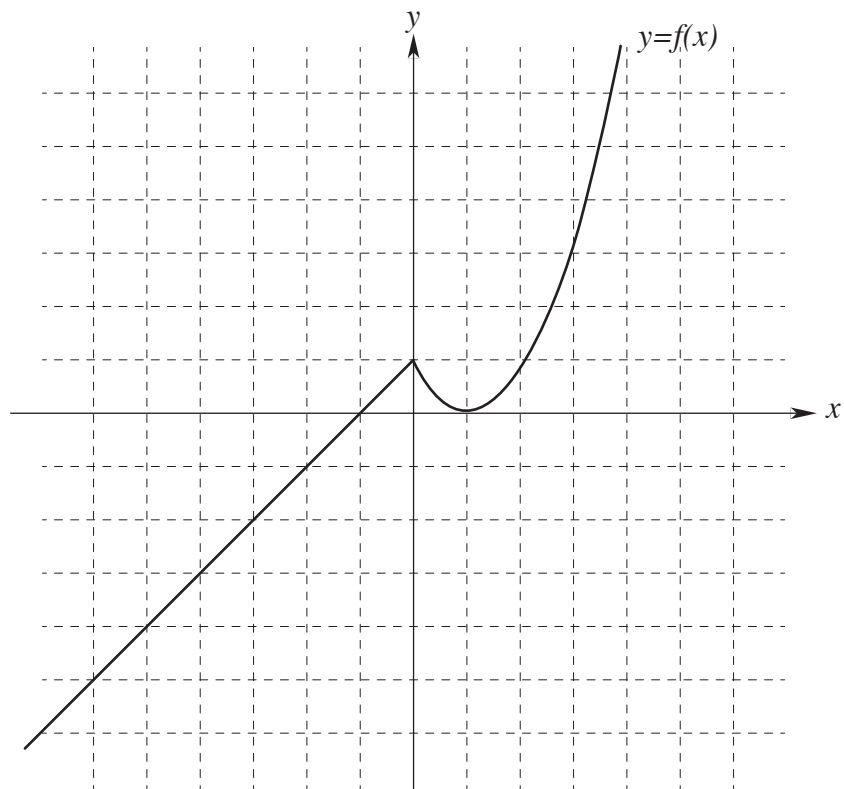
(b) The range of $f(x)$

(c) $f(0)$

(d) $f(-10)$

(e) $f(100)$

5. (5 points) Let $f(x)$ be the function with the following graph (scale: each box $= 1$ square unit).

   (a) On the same grid, graph the function

$$g(x) = -f(x-1) + 2.$$

   (b) Use the graph above to solve the inequality $f(x) \geq 1$. Use words and/or a picture to explain how you arrived at your answer.

6. (10 points) Find the difference quotient

$$\frac{f(x+h) - f(x)}{h}, h \neq 0$$

for the function $f(x) = 5x^2 - 3x$ and simplify.

7. (5 points) Let $f(x) = 3x^2 - 5$ and $g(x) = \sqrt{x-1}$.

   (a) Find $\left(\frac{g}{f}\right)(x)$.

   (b) Determine the domain of $\left(\frac{g}{f}\right)(x)$.

8. (5 points) Let $f(x) = 3x^2 - 5$ and $g(x) = \sqrt{x-1}$.

   (a) Find $(f \circ g)(x)$.

   (b) Determine the domain of $(f \circ g)(x)$.

9. (5 points) Let $f(x) = \frac{x-3}{x+4}$. Determine whether $f(x)$ is invertible. If $f(x)$ is invertible, find its inverse. If $f(x)$ is not invertible, explain why not.