

INSTRUCTIONS: **Simplify** and **box** all your answers. Write neatly and **justify all answers**. A correct answer with incorrect work or no justification may receive no credit. Books, notes, electronic devices, other unauthorized devices, and help from (or giving help to) another person are not permitted while taking the exam. The exam is worth 100 points.

Potentially useful formulas:

(i) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

(ii) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

(iii) Equation of a circle: $(x - h)^2 + (y - k)^2 = r^2$

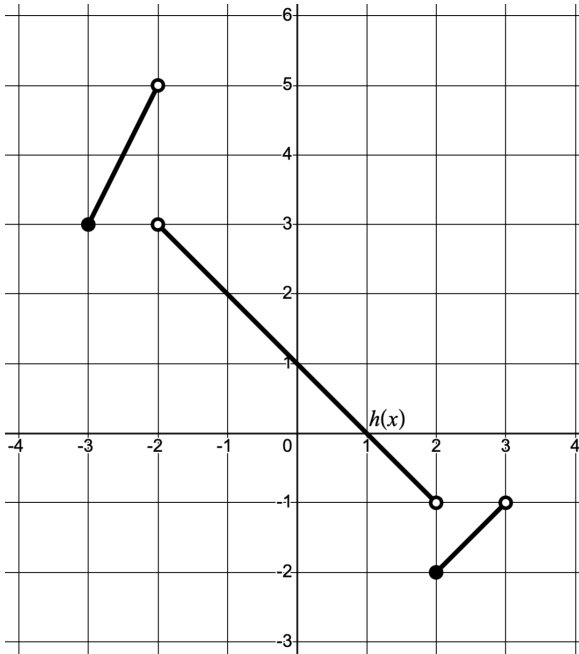
Note: You may tear off this first page and use front and back as scratch paper.

- i. Do not start until instructed by a proctor.
- ii. The exam is on both sides of each following page.
- iii. Write your name on the next page.
- iv. When you finish (if before the exam end time), please quietly collect your things and move to the submission area to upload your answers with supporting work to gradescope and hand in your physical copy.
- v. If the upload area is very crowded, we recommend checking your work and waiting until the area is less busy. Thank you for your patience!

Name: _____

1. Use the table of values of $p(x)$ and the graph of $h(x)$ (which consists of all three line segments) provided here to answer each of the problems below. No justification is required for this problem (though justification can help earn potential partial credit). (16 pts):

x	$p(x)$
-1	-2
0	2
1	-2
2	-3
3	5



- (a) Identify the domain of $h(x)$.
- (b) Identify the range of $h(x)$.
- (c) Find $(h + p)(0)$.
- (d) If we know $p(x)$ is an even function find the value $p(-3)$.
- (e) Find $(h \circ h)(-1)$.
- (f) Is $h(x)$ one-to-one? Give a brief sentence why $h(x)$ is or isn't one-to-one.
- (g) Find the x -values where $h(x) \leq 0$. Give your answer in interval notation.
- (h) Solve the equation $h(x) = 3$.

2. Solve the following inequalities. **Justify your answers by using a number line or sign chart when appropriate.** Answers without full justification will not receive full credit. Express all answers in interval notation. (11 pts)

(a) $\frac{1}{2}x - \frac{5}{12} < \frac{1}{3}$

(b) $x^4 - 5x^3 - 6x^2 > 0$

(c) $\frac{-4}{x+2} \leq 0$

3. Solve the following equation: (4 pts)

$$|2x - 1| = 4$$

4. Solve the following equation: (5 pts)

$$\frac{1}{3(x+1)} + \frac{x+2}{x^2+x} = -\frac{5}{3x}$$

5. The following are unrelated: (6 pts)

(a) Find the equation of the line parallel to the x -axis and through the point $(-1, 4)$.

(b) Find all value(s) of c such that the distance between the two points, $(4, c)$ and $(2, 0)$, is 3.

6. Biologists have observed that the movement speed, v measured in inches per second, of a certain species of lizard depends on temperature, t measured in degrees Fahrenheit. The relationship appears to be very nearly linear. A lizard moves 4 inches per second at 50° F and 6 inches per second at 70° F. (7 pts)

(a) Find the slope of the linear equation that relates the temperature t and the speed v .

(b) What are the units of the slope of the linear equation that relates the temperature t and the speed v .

(c) Find the linear equation that relates the temperature t and the speed v .

7. Find the center and radius of the circle given by: $x^2 - 4x + y^2 = 5$. (4 pts)

8. Find the domain of the following functions. Express your answers in interval notation. (13 pts)

(a) $n(x) = x - |5x| + 13$

(b) $s(x) = \frac{x^2 - 4x + 3}{2x^2 - 6x}$

(c) $h(x) = \frac{x\sqrt{5-3x}}{4-x^2}$

9. For $f(x) = \frac{x+5}{x-2}$ and $g(x) = x + \frac{5}{x} + 3$, find the following: (11 pts)

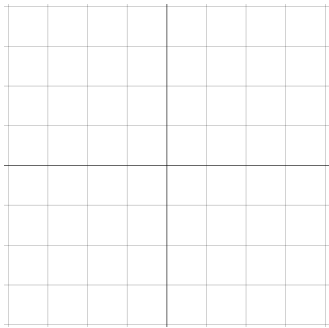
(a) Is $g(x)$ odd, even, or neither? As usual, fully justify your answer for credit.

(b) Find $h(x) = \left(\frac{f}{g}\right)(x)$. As usual, simplify your final answer.

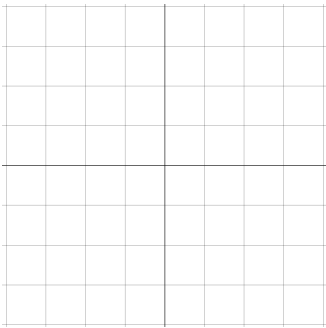
(c) Find the domain of $h(x) = \left(\frac{f}{g}\right)(x)$. Express your answer in interval notation.

10. Sketch the shape of the graph of each of the following on the provided axes. **Make sure to label relevant value(s) on your axe(s).** (16 pts)

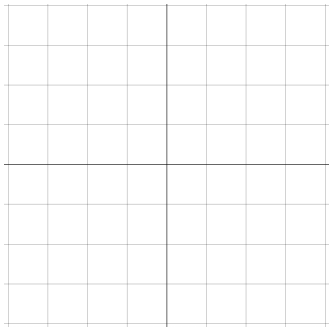
(a) $f(x) = x^2 - 2$



(b) $g(x) = -|x|$



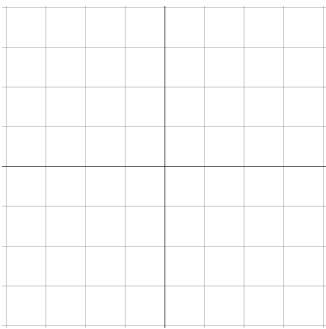
(c) $k(x) = (x - 1)^3$



(d) $(x + 2)^2 + (y - 1)^2 = 1$

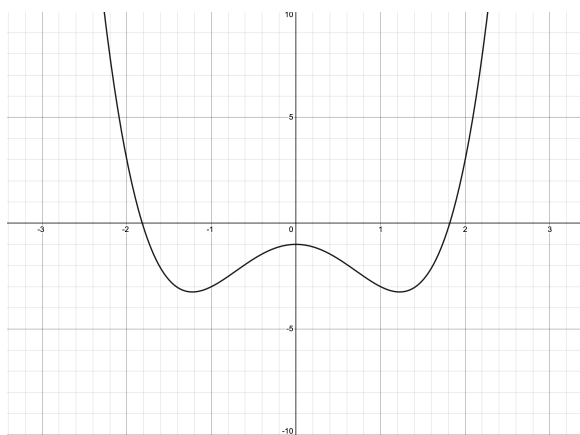


(e) $q(x) = \begin{cases} 2x - 1 & \text{if } x \leq 0 \\ \frac{1}{x} & \text{if } x > 0 \end{cases}$



EXAM CONTINUES ON BACK

11. Given the graph of a function below, is the function odd, even, or neither? **No justification is needed.** (2 pts)



12. A wire 13 inches long is cut into two pieces, the first piece has length x and the second piece has length y . The **first piece** is bent into the shape of a **square** and the **second piece** is bent into the shape of a **circle**. Express the total area of the square and circle as a function of x . (5 pts)