
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, and electronic devices 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: $(x - h)^2 + (y - k)^2 = r^2$

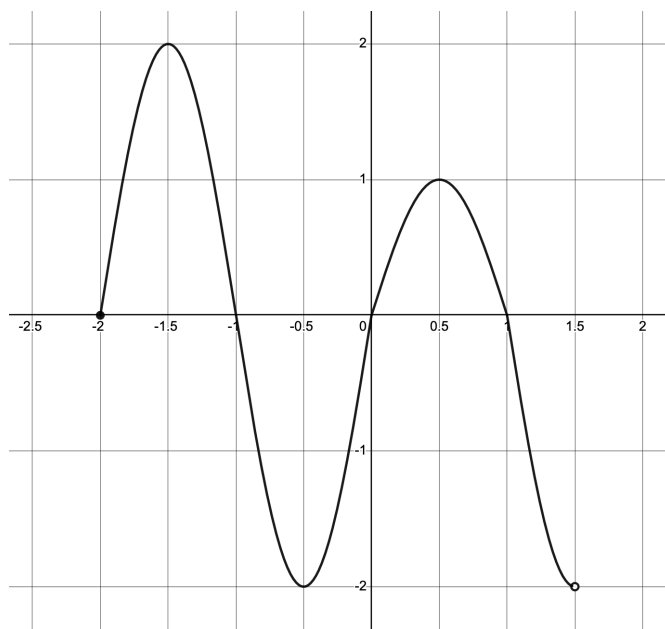
NOTE: YOU MAY TEAR OFF THIS FIRST PAGE AND USE (FRONT AND BACK) AS SCRATCH PAPER.

- i. DO NOT START UNTIL INSTRUCTED BY A PROCTOR.
- ii. THE EXAM IS ON BOTH SIDES OF EACH FOLLOWING EXAM PAGE
- iii. WRITE YOUR NAME ON THE NEXT PAGE. JUST BEFORE YOU UPLOAD TO GRADESCOPE WRITE DOWN YOUR UPLOAD TIME 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.

Name: _____

Upload time: _____

1. Answer the following for the given graph of a function f (no justification is needed for this problem) (11pts):



- (a) Identify the domain of f .
- (b) Identify the the range of f .
- (c) Find $f(-2)$ if it exists.
- (d) Find $(f + f)(-1.5)$
- (e) Is f odd, even, or neither?
- (f) Find $(f \circ f)(0.5)$.
- (g) f is not one-to-one. Why isn't it?
- (h) Identify a restriction of the domain so that f is one-to-one and has the same range as in part (b).
- (i) Use your domain restriction to calculate $f^{-1}(0)$.
- (j) **True** or **False**: The only local minimum of the function f is $y = 0$.
- (k) Find the x -values where $f(x) > 0$. Give your answer in interval notation.

2. The following are unrelated: (10 pts)

(a) Find the equation of the line through the points $(-2, 3)$ and $(1, -4)$.

(b) Find the equation of the line parallel to the x -axis and through the point $(-2, -4)$.

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

3. Find the center and radius for: $x^2 + y^2 - 4y = 3$. (3 pts)

4. Find the domain of the following functions. Express your answers in interval notation. (15 pts)

(a) $n(x) = 4x + |3x| + 3$

(b) $h(x) = \frac{x\sqrt{1-x}}{x+2}$

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

5. For $f(x) = \frac{1}{x+2}$ and $g(x) = x^2 - 4$, find the following: (10 pts)

(a) Find $g(2)$

(b) Find $g(a)$

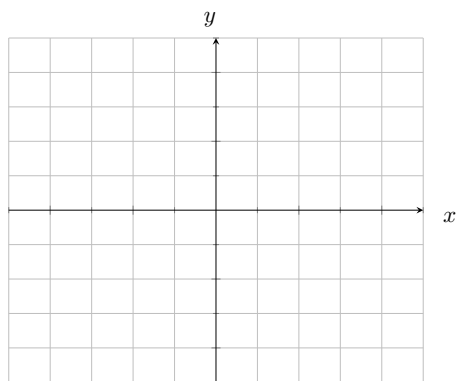
(c) Find $(f \circ g)(x)$.

(d) $(fg)(x)$ and its domain.

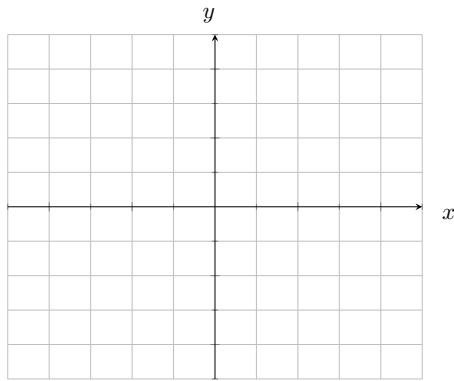
6. Find the average rate of change of the function $g(x) = x^2 - 3$ between $x = a$ and $x = a + h$. (4 pts)

7. 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) (19 pts)

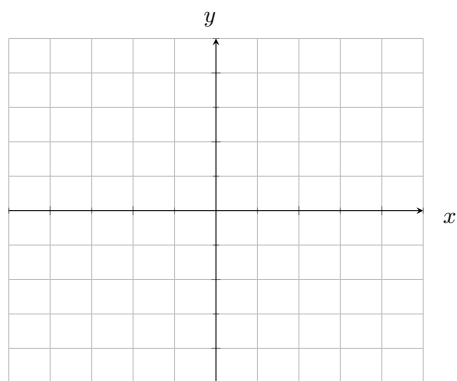
(a) $f(x) = (x - 1)^2$



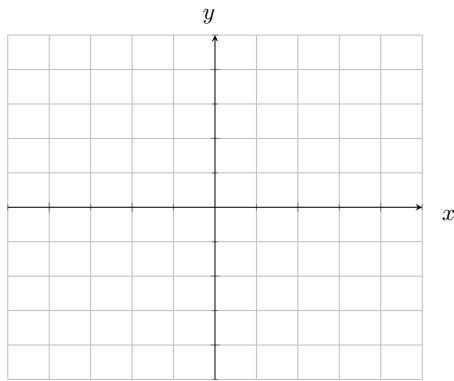
(d) $g(x) = -|x|$



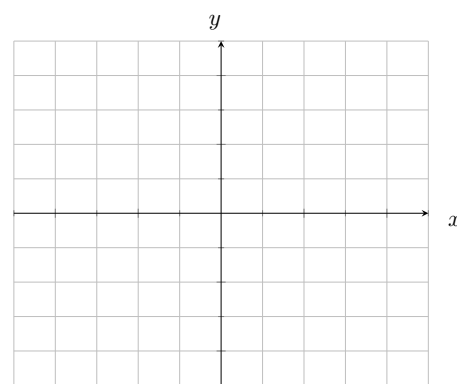
(b) $k(x) = x^3 + 1$



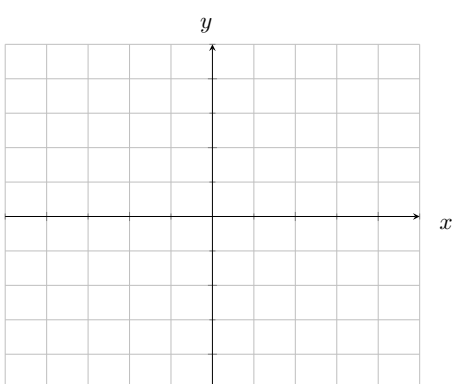
(e) $m(x) = \sqrt{-x}$



(c) $(x - 1)^2 + (y + 2)^2 = 4$



(f) $q(x) = \begin{cases} 2x - 1 & \text{if } x \leq 0 \\ \sqrt[3]{x} & \text{if } x > 0 \end{cases}$



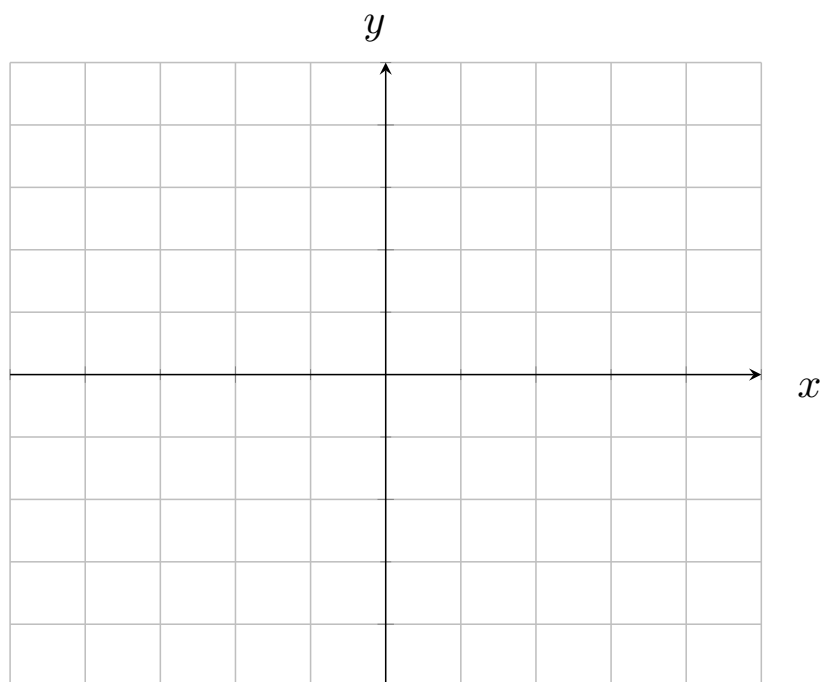
8. For $P(x) = -x^4 + 6x^3 - 5x^2$ answer the following. (7 pts)

(a) Indicate on a graph or use arrow notation to indicate the end behavior of $P(x)$.

(b) Find all zeros and identify the multiplicity of each zero.

9. Sketch the shape of the graph of a polynomial function, $f(x)$, that satisfies **all** of the information. **Label** all intercepts on the graph. (5 pts)

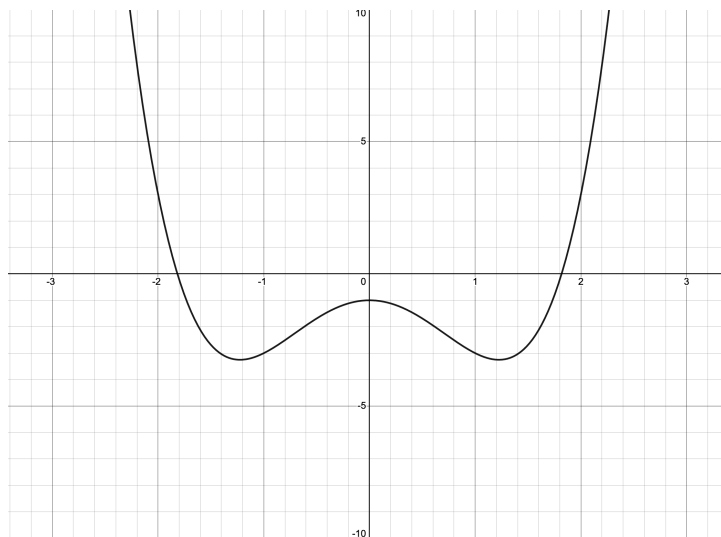
- i. The graph has y -intercept $(0, -3)$.
- ii. The graph has end behavior consistent with $y = x^3$.
- iii. The graph bounces (touches but does not cross) at $(-2, 0)$ and crosses at $(1, 0)$.
- iv. The graph has no other x -intercepts.



10. Use long division to find the quotient and remainder when $2x^4 + 4x^3 - 2x^2 + 2$ is divided by $x^2 + 2x + 1$. (4 pts)

11. (a) Is $f(x) = x^4 + 2x^2 - 1$ odd, even, or neither? Justify your answer for credit. (4 pts)

- (b) Given the graph of a function below, is the function odd, even, or neither? **No justification is needed.** (3 pts)



12. A wire 10 cm long is cut into two pieces, one of length x and the other of length y . Each piece is bent into the shape of a square. Express the total area of the two squares as a function of x . (5 pts)