

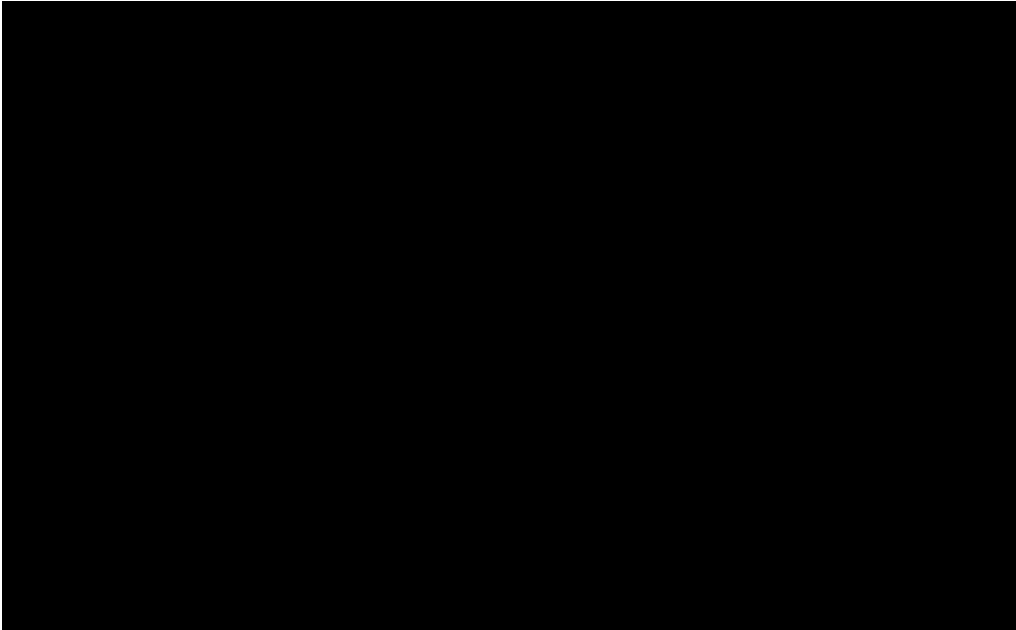
INSTRUCTIONS: **Simplify** and **box** all your answers. Write neatly and **justify all answers**. A correct answer with incorrect work or no justification may receive no credit. Books, notes, electronic devices, other unauthorized devices, and help from another person are not permitted while taking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

Potentially useful formulas:

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

Name: _____

1. Refer to the given graph of $f(x)$ to answer the following: (9 pts)



(a) Find the domain of $f(x)$. Express your answer in interval notation

(b) Find the range of $f(x)$. Express your answer in interval notation

(c) Find $(f + f)(-2)$

(d) Find $(f - f)(3)$

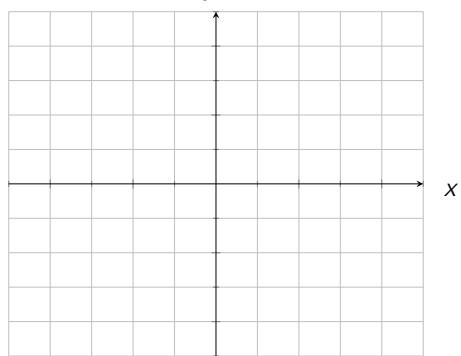
(e) Find $jf(-4)j$

(f) Solve $f(x) = -3$

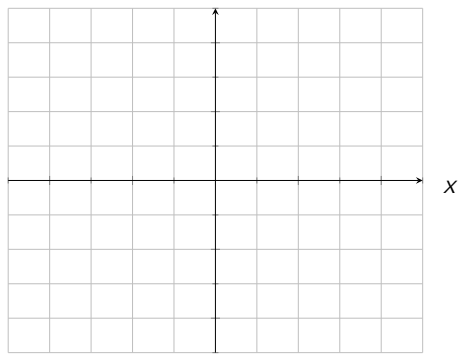
(g) Find

5. Sketch the graph of the following (graph each function on a **separate** set of axes). Label values on your axes: (19 pts)

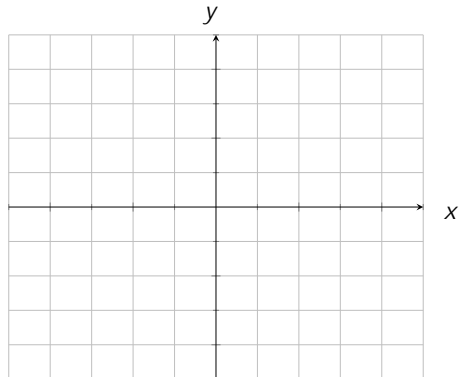
(a) $f(x) = x^2 + 1$



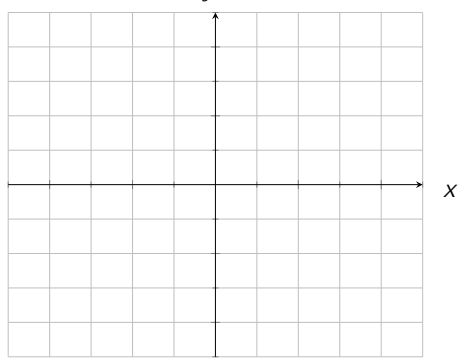
(b) $g(x) = (x - 1)^3$



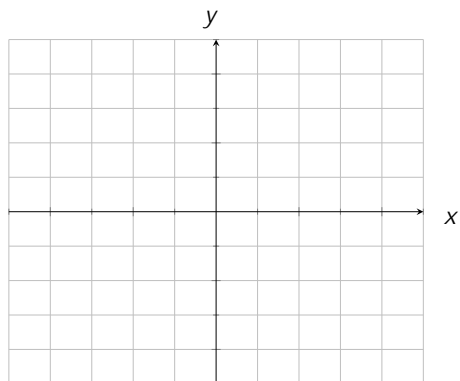
(c) $h(x) = 2|x| + 1$



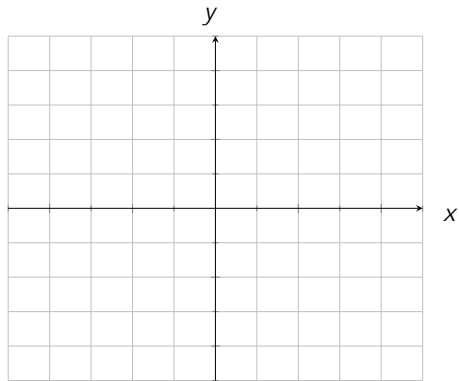
(d) $i(x) = \frac{1}{x}$



(e) $j(x) = \sqrt[3]{x} + 1$



(f) $k(x) = \begin{cases} 2 & x < 1 \\ x & x > 1 \end{cases}$



9. The points $(-1; 2)$ and $(1; 4)$ lie directly opposite each other on a circle such that the distance between the two points gives the diameter of the circle. Answer the following: (9 pts)

(a) What is the radius of the circle?

(b) Where is the center of the circle?

(c) Using the above, write down the equation of the circle in standard form

10. Find the inverse of the function $f(x) = \frac{1}{2x^3} + 7$ (4 pts)

11. The small amount you put in your savings account a few years ago is growing rapidly(Yay!). Below is a graph of your balance $A(t)$ in dollars, as a function of time t in years.

13. The graph of a polynomial, $P(x)$, has the following properties: (8 pts)

- i. The graph has end behavior that is consistent with the end behavior of $y = x^3$ (In arrow notation: $P(x) \rightarrow 1$ as $x \rightarrow 1$ and $P(x) \rightarrow 1$ as $x \rightarrow 1$).
- ii. The graph crosses at x -intercept $(-2; 0)$.
- iii. The graph bounces (touches but does not cross) at x -intercept $(1; 0)$.
- iv. The graph has no other x -intercepts.
- v. The graph has y -intercept $(0; -4)$.

Answer the following for $P(x)$:

- (a) Sketch a graph of $P(x)$ that satisfies **all** of the given information.

