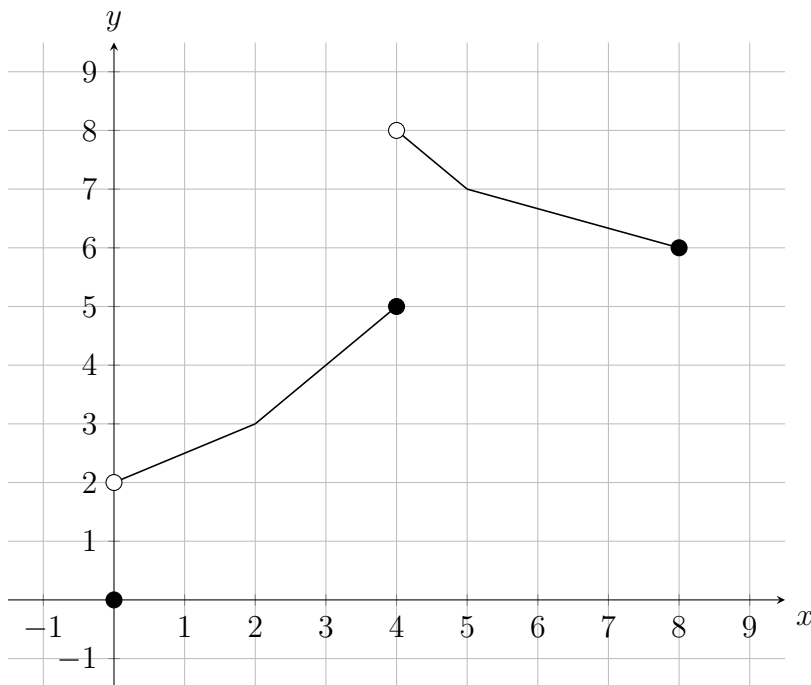


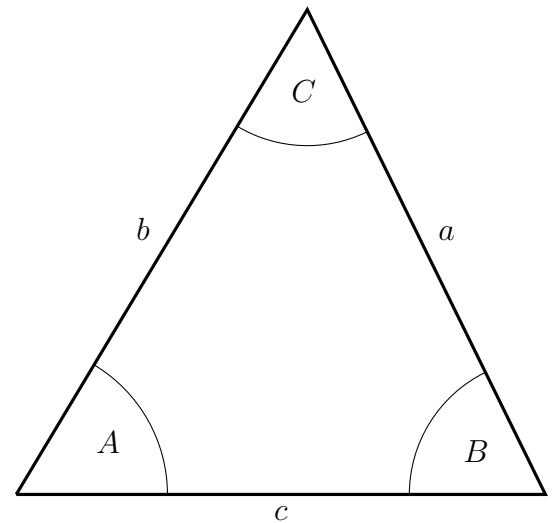
1. (4 points) Consider two functions: a function  $f$  defined by the graph of  $y = f(x)$  shown below and a function  $g$  defined by the formula  $g(x) = 3x + 1$ .



Evaluate each of the following, or state that it is undefined.

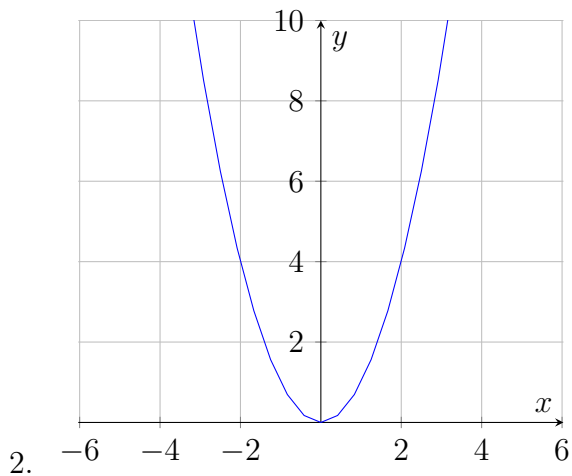
- $f(4)$
  - $f^{-1}(7)$
  - $(g \circ f)(2)$
  - $(g/f)(0)$
2. (2 points) Sketch an example of a function that does not have an inverse function.
3. (2 points) Let  $g$  be a function defined by  $g(x) = 2x - 1$ . Evaluate  $g^{-1}(5)$ .
4. (2 points) Solve the equation  $x^3 + 4x^2 - 9x - 36 = 0$ .
5. (3 points) Use polynomial long division to divide  $(x^3 + 2x^2 + 2x) \div (x^2 + 2)$  and express your answer in the form  $Q(x) + \frac{R(x)}{D(x)}$ .
6. (4 points) Given the quadratic function  $f(x) = 4x^2 - 8x - 5$ ,
- Find the coordinates of all intercepts.
  - Find the coordinates of the vertex.
  - Sketch a graph of the function using the information from the previous parts.
7. (3 points) Let  $f(x) = \frac{(x+5)(x-3)}{(x-4)(x+2)}$  and  $g(x) = \frac{x(x-3)}{x(x-2)(x+2)}$ .

- (a) Find the domain of  $\left(\frac{f}{g}\right)(x)$ .
- (b) Simplify  $\left(\frac{f}{g}\right)(x)$  as much as possible.
8. (4 points) Solve the equation  $\frac{2x^2}{(x+1)(x+5)} - \frac{2x^2}{(x-5)(x+5)} = \frac{3x}{(x-5)(x+1)}$ .
9. (3 points) Solve the rational inequality  $\frac{x}{(x-1)(2-x)} \geq 0$ .
10. (3 points) Simplify  $\frac{\sqrt[3]{125x^9y^6}}{\sqrt{(25x^2y^8)}}$ . You may assume that  $x$  and  $y$  are positive. All exponents in your answer should be left as positive.
11. (3 points) Find the domain of  $f(x) = \sqrt{(x-2)(x+3)}$ .
12. (4 points) Solve the equation  $\log_3(x+4) + \log_3(x) = \log_3(x+2) + 1$ .
13. (4 points) Solve the equation  $7^{4x+1} = 5^{1-x}$  and round your answer to three decimal places.
14. (6 points) Let  $g(x) = \log_3(x+1) - 1$ .
- (a) State the domain of  $g(x)$  as an interval.
- (b) Find all intercepts.
- (c) Find the equation of any asymptote that  $g(x)$  may have.
- (d) Sketch the graph  $y = g(x)$ . Indicate all intercepts and asymptotes that  $g(x)$  may have.
15. (3 points) Simplify  $\frac{\sec \theta - \sin \theta \tan \theta}{\cos \theta}$ .
16. (4 points) Find all angles  $\theta$  in the interval  $[0^\circ, 360^\circ)$ , in degrees, where  $\cot \theta = \frac{1}{3}$ . Round all your answers to two decimal places.
17. (4 points) An angle  $\theta$  is in the third quadrant and satisfies  $\cos \theta = -\frac{2}{3}$ . Find the **exact value** of  $\tan \theta$  **without** explicitly finding  $\theta$ .
18. (4 points) The angle of elevation to the top of a lighthouse is  $45^\circ$  from a point on the ground. At another point 150m closer to the lighthouse, the angle becomes  $60^\circ$ . How tall is the lighthouse? Round your answer to a whole number.
19. (3 points) Consider a triangle with angles of measure  $A$ ,  $B$  and  $C$ , across from sides of length  $a$ ,  $b$  and  $c$  respectively. If  $A = 60^\circ$ , side  $a$  is of length 11cm and side  $b$  is of length 10cm, find the angle  $B$  in degrees. Round your answer to two decimal places.

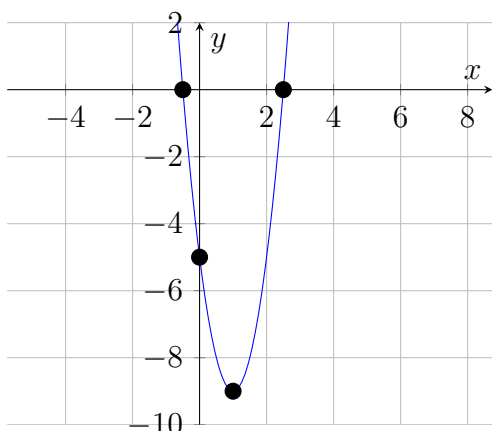


## Answers

- (a) 5  
(b) 5  
(c) 10  
(d) Undefined



- 3
- $\pm 3, -4$
- $x + 2 - \frac{4}{x^2 + 2}$
- (a)  $(0, -5), (5/2, 0), (-1/2, 0)$   
(b)  $(1, -9)$



(c)

7. (a)  $\mathbb{R} \setminus \{\pm 2, 0, 3, 4\}$

(b)  $\frac{(x + 5)(x - 2)}{(x - 4)}$

8.  $x = 0$

9.  $(-\infty, 0] \cup (1, 2)$

10.  $\frac{x^2}{y^2}$

11.  $(-\infty, -3] \cup [2, \infty)$

12. 2

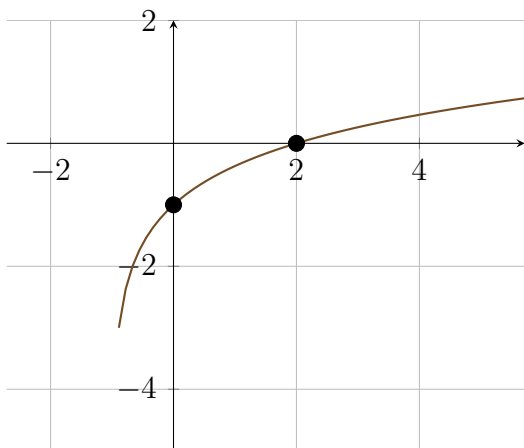
13. -0.036

14. (a)  $(-1, \infty)$

(b)  $(0, -1), (2, 0)$

(c)  $x = -1$

(d)



(e)

15. 1

16.  $71.57^\circ$ ,  $251.57^\circ$

17.  $\frac{\sqrt{5}}{2}$

18. 355m

19.  $51.93^\circ$