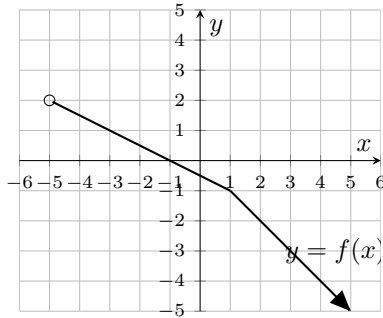


1. (6 points) Let $f(x)$ be defined by the following graph.



- Evaluate $2f(-1)$.
 - Evaluate $(f \circ f)(3)$.
 - Evaluate $f^{-1}(-2)$.
 - Find the range of $f(x)$.
 - Sketch the graph of $-f(x) + 2$.
2. (3 points) Let $f(x) = 2x + 1$ and $g(x) = 7x - 4$. Solve

$$2f(x) \leq 3g(x) + x + 1$$

3. (7 points) Let $f(x) = \begin{cases} -x + 2 & x < 1 \\ 2x - 4 & x > 1 \end{cases}$
- Sketch the graph of $y = f(x)$.
 - State the domain and range of $y = f(x)$.
 - Evaluate

i. $(f \cdot f)(2)$. ii. $(f \circ f)(2)$.

- (d) Does f have an inverse? Why or why not?

4. (4 points) Factor each of the following expressions completely.

- $4x^2(x + 1) + 16x^4(x + 1)$
- $x^3 + 2x^2 - 25x - 50$

5. (5 points) Consider the function $f(x) = -2x^2 + 12x - 10$.

- Put the function in vertex form by completing the square.
- Sketch the graph of f . Label the vertex, y -intercept and x -intercept(s) (if any exist).

6. (9 points) Solve each of the following equations for x .

- $4x^4 + 7x^2 - 2 = 0$
- $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2 - 8x + 12}$
- $\sqrt{-x + 22} = x - 2$

7. (2 points) Perform the long division clearly indicating the quotient and the remainder :

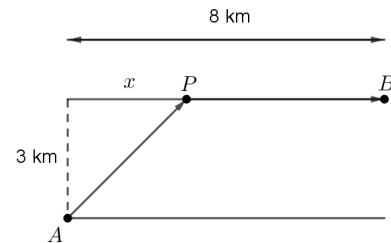
$$\frac{x^3 + 5x - 1}{x + 1}$$

8. (7 points) Simplify the following expressions:

- $\frac{\frac{x}{10} + \frac{x}{x-5}}{\frac{x}{5} - \frac{5}{x}}$
- $\frac{x^3 - 8}{x - 7} \div \frac{x^2 + 5x - 14}{x^2 - 49}$

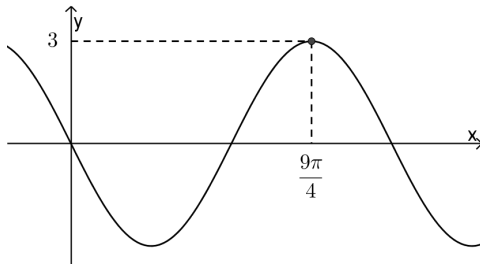
9. (4 points) Given the rational function $f(x) = \frac{2x + 6}{x - 2}$,
- find the coordinates of all intercepts,
 - find all the asymptotes and
 - sketch the graph.

10. (2 points) A man launches his boat from point A on a bank of a straight river, 3 km wide, and wants to reach point B , 8 km downstream on the opposite bank. He chooses to row to some point P that is x kilometers downstream on the opposite bank and then walk towards point B . Find the total distance the man travels as a function of x .

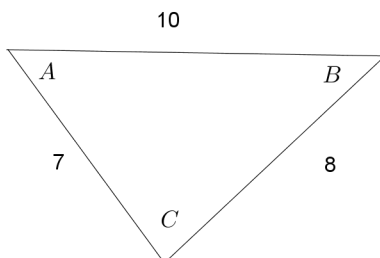


11. (3 points) Simplify the radical expression $\frac{\sqrt[3]{27x^4} \sqrt[6]{x^{19}}}{\sqrt{9x^7}}$.
12. (3 points) Rationalize the denominator of $\frac{2 + 2\sqrt{5}}{\sqrt{5} - 1}$ and simplify.
13. (3 points) Find the domain of $f(x) = \frac{x - 2}{1 - x^2} - \frac{1}{\sqrt{3 - x}}$.
14. (2 points) Find the future value of \$ 25000 invested at a rate of 8% for 15 years compounded monthly. (Answer to the nearest cent.)
15. (1 point) Compute $\log_5(10000)$. (Three decimal places.)
16. (4 points) Consider the function $f(x) = 3e^{x-2} + 8$.
- Find the equation of any asymptote that $f(x)$ may have.
 - Find a formula for $f^{-1}(x)$.
17. (5 points) For the function $f(x) = 3 - \log_2(x + 2)$,
- find the coordinates of all intercepts
 - find the equations of all asymptotes
 - sketch a graph.

18. (2 points) Express $\ln\left(\frac{\sqrt{x}}{\sqrt[3]{ey^2}}\right)$ in terms of the simplest possible logarithms.
19. (3 points) Solve: $\log x - \log 2 = 1 - \log(x - 1)$
20. (3 points) Solve: $7^{x+4} = \frac{1}{3^{2-x}}$. Give an exact value.
21. (3 points) Let the angle θ in standard position whose terminal side contains the point $(2, -5)$. Find the exact values of
- $\sin \theta$
 - $\sec \theta$
 - $\cot \theta$
22. (2 points) With a calculator, find all angles between $[0^\circ, 360^\circ)$ for which $\tan \theta = -2$. Round your answer to two decimal places.
23. (2 points) Find the exact value of $\sec(210^\circ)$.
24. (1 point) Convert 280° into radians.
25. (2 points) Without a calculator, find all angles between $[0, 2\pi)$ for which $\csc \theta = \sqrt{2}$. Give exact values in radians.
26. (3 points) A surveyor is standing in front of a 2km wide straight river and starts looking directly at the opposite shore. If he turns 20° to the right, he notices a statue. If he then turn 10° further, he notices a second statue. Find the distance between the two statues?
27. (3 points) The following graph is either of the form $y = a \sin(bx)$ or $y = a \cos(bx)$. Circle the correct form and find a and b .



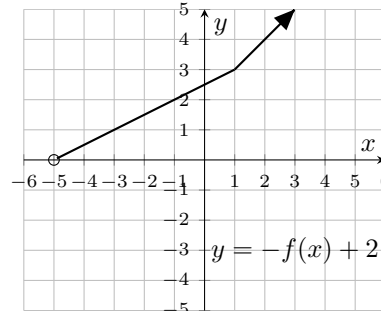
28. (3 points) Simplify $\frac{\sin x}{\sec x - \cos x}$ completely.
29. (3 points) Find all angles in the triangle given below.



Answers

1.

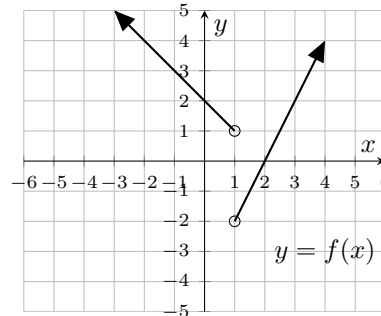
- (a) 0 (b) 1 (c) 2 (d) $(-\infty, 2)$



(e)

2. $x \geq \frac{13}{18}$

3.



(a)

(b) $D : \mathbf{R} \setminus \{1\}, R = (-2, \infty)$

- (c) i . 0 ii . 2

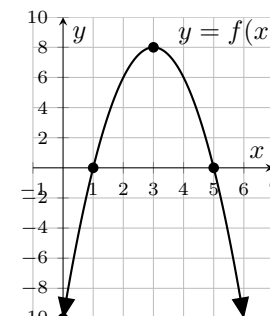
(d) f doesn't have an inverse since it fails the Horizontal Line Test.

4.

- (a) $4x^2(x+1)(1+4x^2)$ (b) $(x-5)(x+5)(x+2)$

5.

(a) $f(x) = -2(x-3)^2 + 8$



(b)

6.

- (a) $-2, -\frac{1}{2}, \frac{1}{2}$ (b) -1 (c) 6

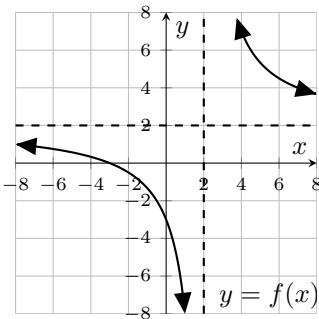
7. $x^2 - x + 6 - \frac{7}{x+1}$

8.

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

9.

- (a) • y -intercept : $(0, -3)$ • x -intercept : $(-3, 0)$
 • Vertical asymptote : $x = 2$
 • Horizontal asymptote : $y = 2$



(b)

10. $f(x) = \sqrt{x^2 + 9} + 8 - x$

11. x

12. $3 + \sqrt{5}$

13. $(-\infty, -1) \cup (-1, 1) \cup (1, 3)$

14. \$ 82673.04

15. 5.723

16.

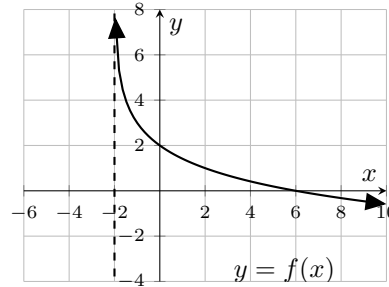
(a) $y = 8$

(b) $f^{-1}(x) = \ln\left(\frac{x-8}{3}\right) + 2$

17.

- (a) • y -intercept : $(0, 2)$ • x -intercept : $(6, 0)$

- (b) Vertical asymptote : $x = -2$



(c)

18. $\frac{1}{2} \ln x - \frac{1}{3} - \frac{2}{3} \ln y$

19. 5

20. $-\frac{\ln\left(\frac{2401}{9}\right)}{\ln\left(\frac{7}{3}\right)}$

21.

- (a) $-\frac{5}{\sqrt{29}}$ (b) $\frac{\sqrt{29}}{2}$ (c) $-\frac{2}{5}$

22. 116.57° and 296.57°

23. $-\frac{2}{\sqrt{3}}$

24. $\frac{14\pi}{9}$

25. $\frac{\pi}{4}$ and $\frac{3\pi}{4}$

26. 0.427 km

27. $y = a \sin(bx)$ with $a = -3$ and $b = \frac{3}{2}$.

28. $\cot x$

29. $A = 52.62^\circ, B = 44.05^\circ$ and $C = 83.33^\circ$