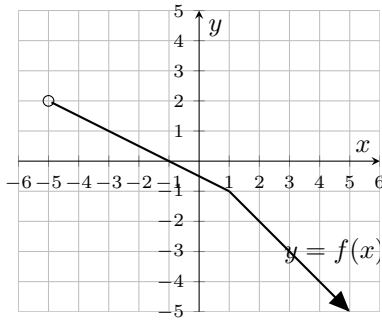


1. (6 points) Let  $f(x)$  be defined by the following graph.



- (a) Evaluate  $2f(-1)$ .  
 (b) Evaluate  $(f \circ f)(3)$ .  
 (c) Evaluate  $f^{-1}(-2)$ .  
 (d) Find the range of  $f(x)$ .  
 (e) 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  $f(x) = \begin{cases} -x + 2 & x < 1 \\ 2x - 4 & x > 1 \end{cases}$
- (a) Sketch the graph of  $y = f(x)$ .  
 (b) State the domain and range of  $y = f(x)$ .  
 (c) 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.

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

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

- (a) Put the function in vertex form by completing the square.  
 (b) 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  $x$ .

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

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

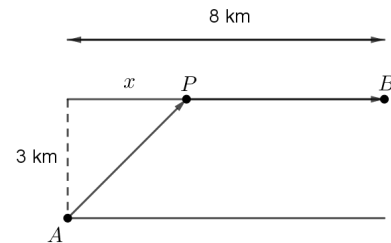
$$\frac{x^3 + 5x - 1}{x + 1}$$

8. (7 points) Simplify the following expressions:

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

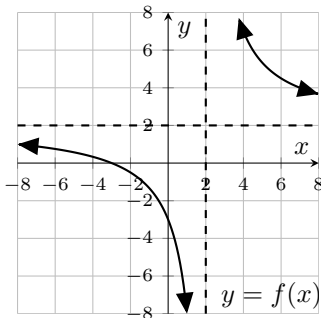
9. (4 points) Given the rational function  $f(x) = \frac{2x + 6}{x - 2}$ ,
- (a) find the coordinates of all intercepts,  
 (b) find all the asymptotes and  
 (c) sketch the graph.

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  $\frac{\sqrt[3]{27x^4} \sqrt{x^{19}}}{\sqrt{9x^7}}$ .
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  $f(x) = 3e^{x-2} + 8$ .
- (a) Find the equation of any asymptote that  $f(x)$  may have.  
 (b) Find a formula for  $f^{-1}(x)$ .
17. (5 points) For the function  $f(x) = 3 - \log_2(x + 2)$ ,
- (a) find the coordinates of all intercepts  
 (b) find the equations of all asymptotes  
 (c) sketch a graph.





(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.

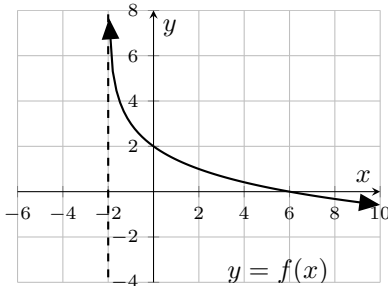
(a)  $y = 8$

(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.  $116.57^\circ$  and  $296.57^\circ$

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  $C = 83.33^\circ$