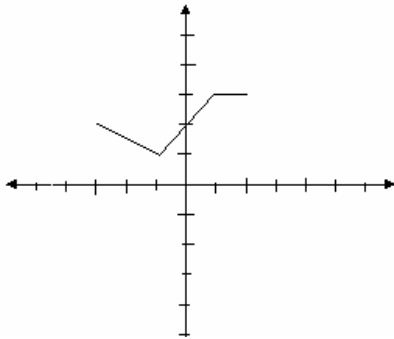


**General test instructions: Show all your work on this test paper!** If you solve a problem algebraically show all your steps. If you solve a problem by graphing on your calculator, show a sketch of the graph, with the solution labeled. **Where appropriate, round answers to 3 decimal places.**

- Solve this system of equations:  
 $2x + y = 5$   
 $3x - 4y = 2$
- Solve:  $x + 3 = 3\sqrt{x+1}$
- Find all real and complex solutions:  
 $4x^2 - 4x + 3 = 0$
- Solve this system of equations:  
 $x^2 = y + 5$   
 $y = 2x + 3$
- A church building fund has invested some money in two ways: part of the money at 7% interest and four times as much at 11%. Find the amount invested at each rate if the total annual income from the interest is \$7650.
- Solve:  $|3 - 4x| < 7$
- Solve:  $\frac{x-3}{x+4} \leq 0$
- Evaluate:
  - $\log_4 e =$
  - $3^{\log_3 \sqrt{2}} =$
- Solve:  $2^{(-3+2x)} = \frac{1}{16}$
- Solve:  $2\log_3(x+4) - \log_3 9 = 2$
- The population of a colony of mosquitoes obeys the law of uninhibited growth. If there are 200 mosquitoes originally and 800 after 3 days, what is the size of the colony after 5 days?
- Graph  
 $f(x) = -\ln(x-4)$  and  
 $g(x) = \log_2(-x)$   
  
Label intercepts and asymptotes.
- List all real zeros and their multiplicities for the following polynomials:
  - $f(x) = 9x - x^3$
  - $f(x) = (x+2)^2 (2x-1)^3 (x^2+4)$
- Write an equation of a third degree polynomial whose graph touches the x-axis at  $-1$  and crosses the x-axis at  $4$ .
- Write this expression in standard  $a + bi$  form.  
 $(3 - 4i)(2 + i)$
- The weekly cost, in dollars of manufacturing  $x$  cell phones is given by  
 $C(x) = 5x^2 - 200x + 4000$ 
  - How many cell phones should be manufactured to minimize the cost?
  - What is the minimum cost?
- Analyze the function  $R(x) = \frac{4(x-2)}{3x-9}$  and find the exact values of the following:
  - y-intercept
  - x-intercept(s)
  - vertical asymptote(s)
  - horizontal asymptote(s)
  - Graph  $y = R(x)$ , including x-intercepts, y-intercepts and asymptotes. Label all intercepts and asymptotes.

18. The graph of  $y = f(x)$  is shown.
- On this same set of axes, sketch the graph of  $y = f(x - 3) - 1$ .
  - On this same set of axes, sketch the graph of  $y = -f(x)$ .



19. Suppose that  $f(x) = \sqrt{x+12}$  and  $g(x) = \frac{1}{x+8}$
- What is the domain of  $f$ ?
  - What is the range of  $f$ ?
- For parts c and d give exact answers.
- Find  $g(89)$ .
  - Find  $(f + g)(0)$ .
  - Find  $(g \circ f)$ .

- 20.a. Find the inverse of  $f(x) = \sqrt{x+1}$ .
- Graph  $f(x)$  and  $f^{-1}(x)$ . Label all intercepts.

21. a. Given the points  $(-1, 3)$  and  $(3, 4)$ , find the equation of the line through the points. Write your answer in slope-intercept form.
- Does the line in part (a) pass through the point  $(7, 5)$ ? \_\_\_\_\_ Explain.

22. The estimated numbers of U.S. children who were home-schooled in the years from 1991 to 1997 were: (In the table year  $x = 1$  refers to 1991.)

Year	Number (in thousands)
1	600
2	703
3	808
4	949
6	1,150
7	1,230

- Draw a scatter plot of the number of children, in thousands, as a function of years since 1990.

- Find the line of best fit to the data. Write the linear function here:
- Fit an exponential curve to the data. Write the exponential function here:
- Graph the best fit line and the best fit exponential curve on the same axes. Which of the two models fits the data better? \_\_\_\_\_ Explain:
- Using the model you chose in part (d), estimate the number of children who were home-schooled in 1995.

- 23 a. Sketch the graphs of  $f(x)$ ,  $g(x)$ , and  $h(x)$ .

$$f(x) = -|x+2| - 1$$

$$g(x) = x^2 + 3$$

$$h(x) = \sqrt{x+2}$$

- Which function or functions have an inverse function?
- Which function or functions are even?
- Which function or functions are decreasing on the interval  $(-2, ?)$ ?

24. a. Graph the function

$$F(x) = \begin{cases} x^2 - 4, & \text{if } x \leq 2 \\ 3x - 2, & \text{if } x > 2 \end{cases}$$

b. Evaluate:  $f(0) =$  \_\_\_\_\_

c. Evaluate:  $f(2) =$  \_\_\_\_\_

d. Evaluate:  $f(5) =$  \_\_\_\_\_