

**Show all work and justify all answers or credit might not be awarded.**

1. **(5 points)** Solve the inequality and express your answer using set notation or interval notation:

$$(x - 1)(x + 2) < 0$$

Answer: \_\_\_\_\_

2. **(5 points)** Solve the inequality and express your answer using set notation or interval notation:

$$\frac{x - 2}{x + 3} > 0$$

Answer: \_\_\_\_\_

3. **(5 points)**  $x = -4$  is a zero of the polynomial  $p(x) = x^3 - 21x - 20$ . Find all remaining zeros of  $p(x)$ .

Answer: \_\_\_\_\_

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4. **(5 points)** Write  $f(x) = x^2 - 4x - 12$  in the standard form  $f(x) = a(x - h)^2 + k$  **by completing the square.**

Answer: \_\_\_\_\_

5. **(5 points)** Solve the equation  $\log_2(x - 4) = 4$  for  $x$ .

Answer: \_\_\_\_\_

6. **(5 points)** Solve the equation  $(2)^{1-3x} = \frac{1}{8}$  for  $x$ .

Answer: \_\_\_\_\_

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7. (5 points) Find the function that is finally graphed after the following transformations are applied to the graph of  $y = x^2$ .

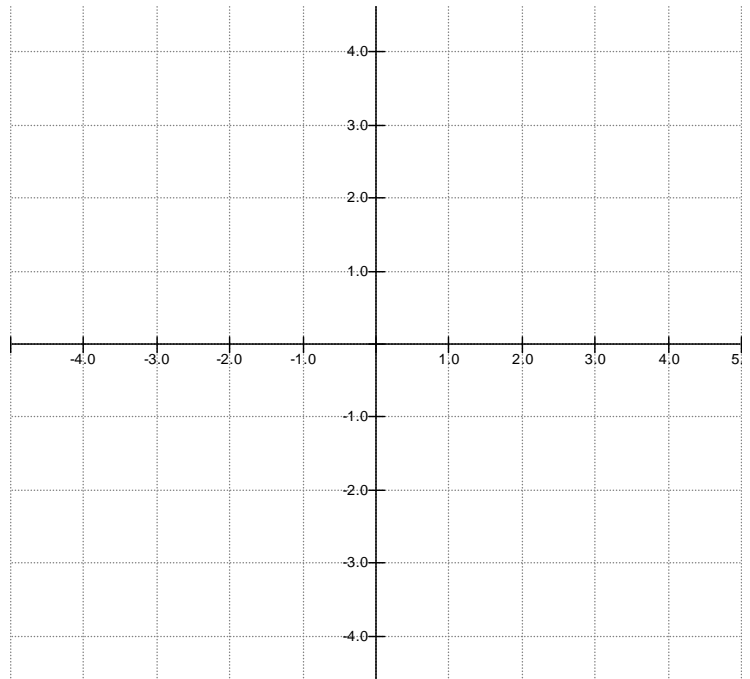
- a. Shifted to the left 4 units.
- b. Reflected about the x axis.
- c. Shifted down 2 units.

Answer: \_\_\_\_\_

8. (10 points) Consider the piecewise function defined below, and answer the given questions.

$$\text{If } f(x) = \begin{cases} x - 2 & \text{if } -3 \leq x < 2 \\ 3 & \text{if } x = 2 \\ -x + 4 & \text{if } 2 < x \leq 4 \end{cases}$$

- a. (2 points) determine the domain of f
- b. (4 points) graph f in the space provided on the right
- c. (2 points) determine the range of f
- d. (2 points) determine  $f(3) - f(-2)$



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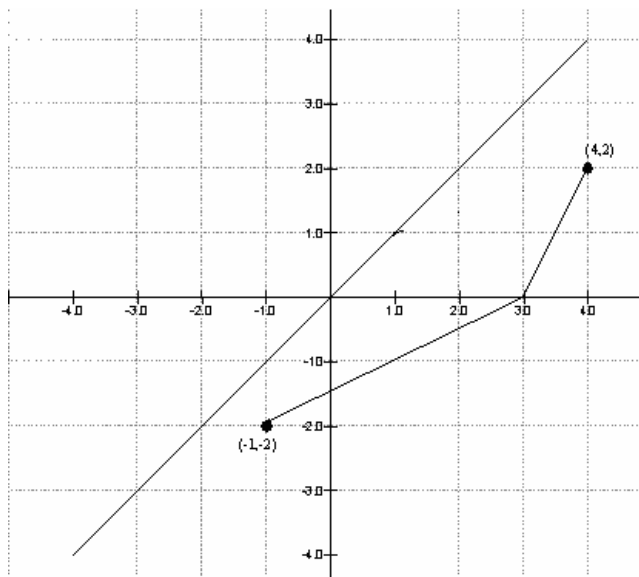
9. **(5 points)** Find the domain of  $f(x) = \frac{\sqrt{x+2}}{x-4}$  and express your answer using set notation or interval notation.

Answer: \_\_\_\_\_

10. **(5 points)** The function  $f(x) = \frac{2}{3-x}$  is one-to-one. Find its inverse.

Answer: \_\_\_\_\_

11. **(5 points)** The graph of a one-to-one function is given. Draw the graph of the inverse function  $f^{-1}$ . (For convenience, the graph of  $y=x$  is also given.)



12. (5 points) Use the graph of the function given on the right to answer the questions below.

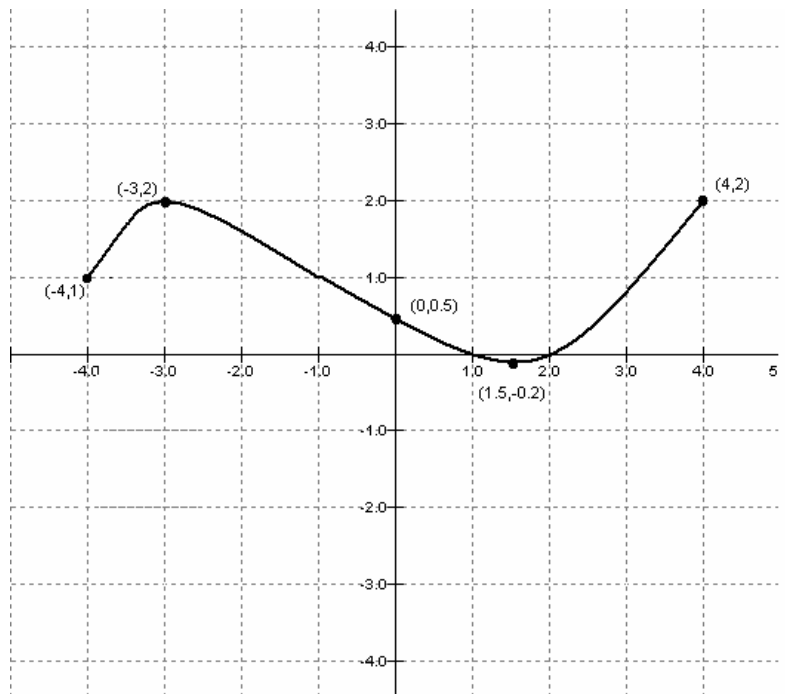
a. What is its range?

b. For what numbers is  $f(x) > 0$ ? (Use interval notation.)

c. List the interval(s) on which  $f$  is increasing.

d. How often does the line  $y = 1$  intersect the graph?

f. What are the  $x$ -intercepts?



13. (5 points) For the functions  $f(x) = \frac{1}{x-2}$  and  $g(x) = \frac{1}{x}$ ,

a. find the composition  $f \circ g$

Answer: \_\_\_\_\_

b. state the domain of  $f \circ g$

Answer: \_\_\_\_\_

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14. **(5 points)** Given the function  $f(x) = x^2 - 3$  Find the average rate of change of  $f$  from 2 to  $x$ :  
 $\frac{f(x) - f(2)}{x - 2}$ , for  $x \neq 2$ . Be sure to simplify the result.

Answer: \_\_\_\_\_

15. **(5 points)** For the function  $f(x) = -2x^2 + 4$  find the following values:

a.  $f(0)$                       Answer: \_\_\_\_\_

b.  $f(-1)$                       Answer: \_\_\_\_\_

c.  $f(-x)$  (do not simplify)    Answer: \_\_\_\_\_

d.  $-f(x)$  (do not simplify)    Answer: \_\_\_\_\_

e.  $f(x+h)$  (do not simplify)    Answer: \_\_\_\_\_

16. **(5 points)** For the function  $R(x) = \frac{2(x-1)(x+4)}{(x-3)(x-2)} = \frac{2x^2 + 6x - 8}{x^2 - 5x + 6}$

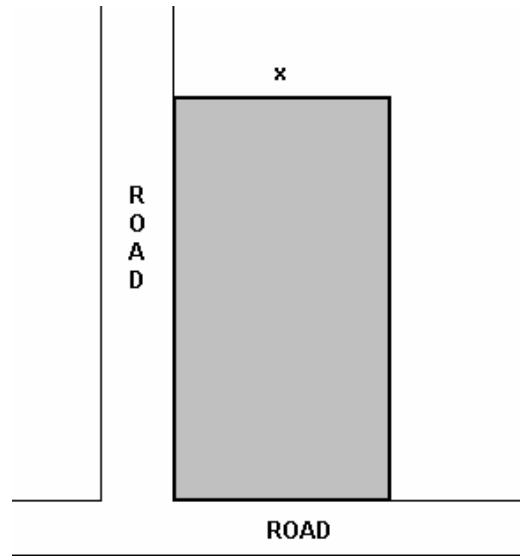
a. Find the vertical asymptote(s).    Answer: \_\_\_\_\_

b. Find the horizontal asymptote(s).    Answer: \_\_\_\_\_

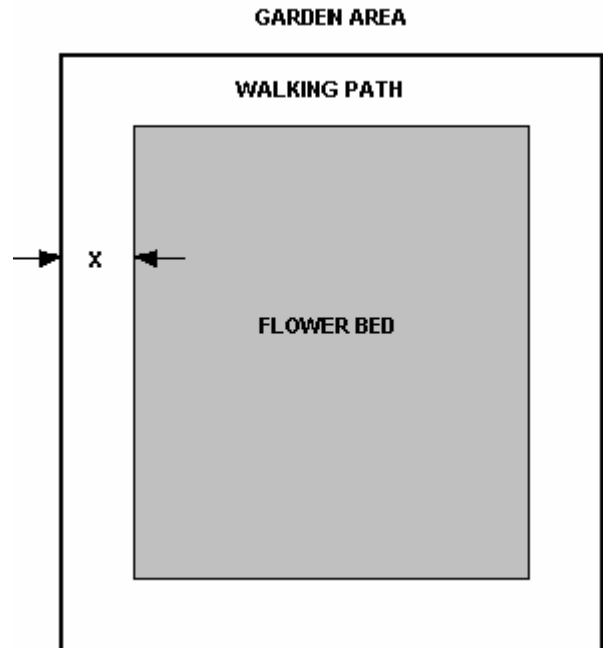
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17. **(5 points)** David has available 100 yards of fencing and wishes to enclose a rectangular area. Two adjacent sides of the rectangle lie along county roads and so are already fenced. Express the area  $A$  of the rectangle as a function of the width  $x$  of the rectangle.

Answer: \_\_\_\_\_



18. **(5 points)** A garden area has dimensions of 60 feet by 200 feet and has a walking path of uniform width  $x$  feet that surrounds the flower bed itself. Write a formula for the area  $A$  of the flower bed as a function of the width  $x$  of the walking path.



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19. **(5 points)** State the following formulas.

a. The equation of a line with slope  $m$  containing the point  $(x_1, y_1)$ .

Answer: \_\_\_\_\_

b. The quadratic formula.

Answer: \_\_\_\_\_

c. The circumference  $C$  of a circle of radius  $r$ .

Answer: \_\_\_\_\_

d. The area  $A$  of a triangle having base  $b$  and height  $h$ .

Answer: \_\_\_\_\_

e. The product rule for logarithms.

Answer:  $\log_a(MN) =$  \_\_\_\_\_