

NOTE: You will be allowed a calculator for application problems only during the exam. All work must be shown in order to earn any points on the exam. Further, while this review is a largely comprehensive refresher of what we've gone over so far, and I largely base my exams off of the reviews I give, the exam could still have problems which are pulled from any part of the lessons/homework/worksheets we've done this term.

1. Completely factor the following polynomials using whatever method is necessary.

a.  $30r^4 - 12r^3 + 42r^2$

d.  $y^2 - 6y + 5$

b.  $x^3 - 3 + 2x^3y - 6y$

e.  $3y^4 - 6y^3 - 24y^2$

c.  $5y^2 - 2y - 7$

f.  $2x^3 + 7x^2 - 18x - 63$

2. Solve the following quadratic equations using the zero-product-principle.

a.  $(2x + 5)(3x - 4) = 0$

c.  $x^2 = -11x - 30$

b.  $3x^2 - 16x - 12 = 0$

d.  $2x^2 - 2x + 3 = 5x + 7$

3. A triangle's base is 4 m more than twice its height, while its area is  $80 \text{ cm}^2$ . Determine the length of the base and the height of the triangle.

4. Evaluate the function  $f(x) = -\frac{2x - 4}{x^2 - 7x - 12}$  at the given values.

a.  $f(0)$

b.  $f(2)$

c.  $f(4)$

5. Let  $g(x) = 2x^2 + 9x + 4$ . Evaluate and solve the following as indicated. State your answer using formal notation as per the notation standards.

a.  $g(0)$

b.  $g\left(-\frac{1}{2}\right)$

c. Solve  $g(x) = 0$ .

6. Let  $h(t) = -12$ . Evaluate and solve the following as indicated. State your answer using formal notation as per the notation standards.

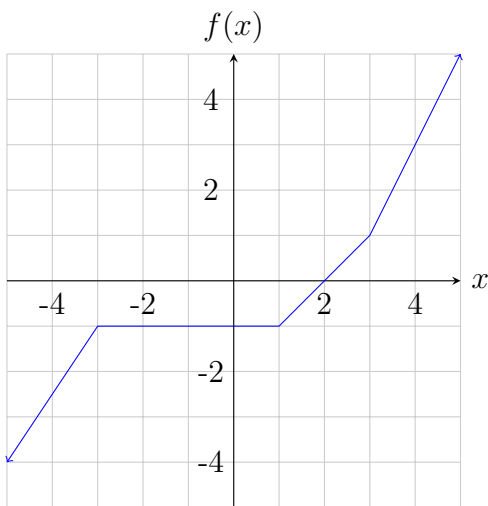
a.  $h(-3)$

b.  $h(-12)$

c. Solve  
 $h(t) =$   
 $-12.$

d. Solve  
 $h(t) = 5.$

7. Given the function  $f$ , shown in the graph below, evaluate or solve as indicated. Use formal notation as per the notation packet.



a.  $f(0)$

b.  $f(-1)$

c.  $f(x) = -1$

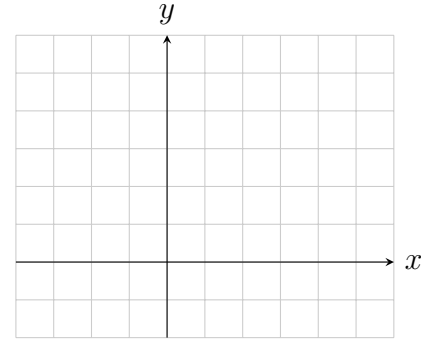
d.  $f(x) = 0$

8. Suppose the function,  $H$ , subtracts 2 from the input and then takes the square of that in order to obtain the output.

a. Give a numeric description of  $H$ .

b. Give a symbolic description of  $H$ .

c. Give a visual description of  $H$ .

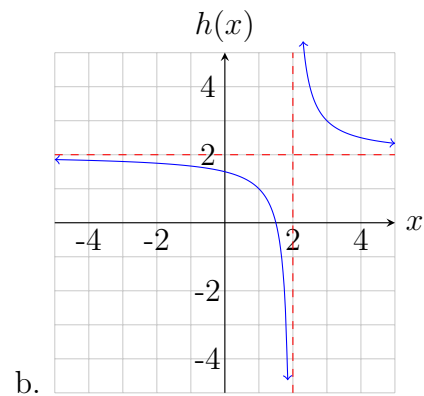
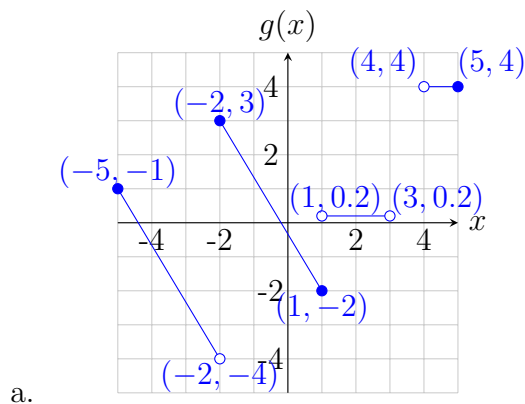


d. What is  $H(4)$ ?

e. Solve  $H(x) = 9$ .

f. What is the domain and range of  $H$ ?

9. Given the following functions, determine their domain and range. State your answers in both interval and set notation per the notation standards.



10. Determine the domain of the following functions.

a.  $K(x) = -\frac{x-5}{3x^2-10x-25}$

c.  $H(t) = \frac{\sqrt{x-1}}{3x-12}$

b.  $k(t) = \sqrt{7-2x}$

d.  $f(t) = -\frac{2x+4}{\sqrt{2x-8}}$

11. You are fencing a rectangular section of your property next to a river and you have purchased 80 meters of fencing (you are not going to fence the side with the river). Determine a function which models the area of the fenced in land. What is the domain and range of this function and what is the maximum area you could have for the rectangle?

12. Given  $g(x) = \frac{-2x}{x-5}$ , simplify the following expressions.

a.  $g(-x)$

c.  $-g(x)$

b.  $g(2x-1)$

d.  $2g(x)-3$

13. The area of a circle can be described as a function of its radius via  $A(r) = \pi r^2$ . Suppose that an oil spill has a radius that is .5 kilometers wide and increasing at a rate of .25 kilometers per day. Describe the area as a function of time.

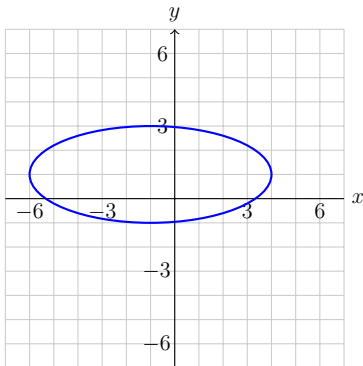
14. Determine whether the following sets of inputs and outputs constitute a function. Explain why or why not. What is the domain and range of each?

a.  $\{(3, 4), (3, 4), (5, 1), (-2, 2)\}$

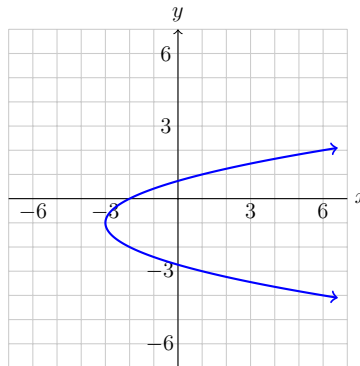
b.  $\{(3, 4), (3, -4), (5, 0), (-5, 0)\}$

15. Which of these graphs constitute  $y$  as a function of  $x$ ? Determine the domain and range of each.

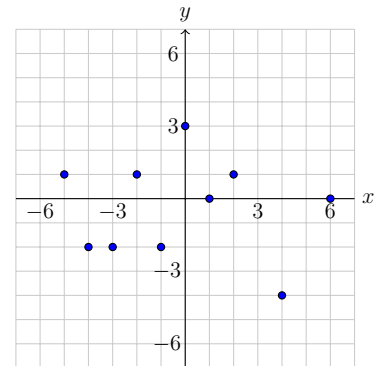
a.



b.



c.



16. Which of the following equations constitute  $y$  being a function of  $x$ ?

a.  $y^3 + x = 4$

c.  $y - x = 7$

e.  $4|x| + 2y + 4 = 0$

b.  $|y| - |x| = 0$

d.  $2y + x^2 - 1 = 7$

f.  $4y^2 + 9x^2 + 1 = 10$

17. In a forest, the number of deer can be modeled by the function  $f(t) = \frac{260t + 260}{0.5t + 6}$ , where  $t$  stands for the number of years from now. Graph the function in GeoGebra. When will there be approximately 230 deer living in the forest? How many deer is the population tending towards as time goes on?

18. Simplify the following rational expressions and, if applicable, write the restricted domain on the simplified expression.

a.  $\frac{x^2 - 4x}{x^2 - 4} \cdot \frac{x^2 + 3x - 10}{x^2 + x - 20}$

c.  $\frac{8t - 32}{7t^2 + 21t - 28} \div \frac{2t^2 - 8t}{t^2 - 2t + 1}$

b.  $f(x) = \frac{x^3 - 16x}{x^2 + 9x + 20}$

d.  $\frac{\frac{12x^2y^3}{25z^2}}{\frac{4x^3y}{125z^5}}$

19. Add or subtract the following rational expressions into a single rational expression and, if possible, simplify the resultant expression. If the domain changes during the simplification, make a note of it.

a.  $\frac{y}{y-2} - \frac{8y-8}{y^2-4}$

d.  $-\frac{3}{r-1} + r$

b.  $\frac{6}{x^2-2x-8} - \frac{1}{x^2+3x+2}$

e.  $\frac{4x}{x-4} + \frac{16}{x-5}$

c.  $\frac{18}{x-3} + \frac{18}{x+3}$

f.  $\frac{3}{x^2-3x+2} - \frac{x+2}{x-2}$



20. Simplify the following complex rational expressions. If the domain changes during simplification, make note of it.

a. 
$$\frac{3}{\frac{2}{x} + \frac{6}{x^2}}$$

c. 
$$\frac{\frac{x+2}{x+3}}{\frac{2}{x+3} - \frac{3}{x-1}}$$

b. 
$$\frac{2\left(\frac{-4x+3}{x-2}\right) + 3}{\frac{-4x+3}{x-2} + 4}$$

d. 
$$\frac{\frac{x}{x+5} + \frac{2}{x-5}}{1 - \frac{x}{x^2-25}}$$

21. Solve the following quadratic equations.

a. 
$$\frac{2}{y+1} = \frac{3}{y}$$

b. 
$$\frac{1}{t+4} + \frac{4}{t^2+4t} = \frac{1}{4}$$

c.  $\frac{6}{x-8} + \frac{9x}{x+4} = \frac{3}{x^2-4x-32}$

d.  $\frac{y-3}{y+9} + \frac{5}{y+7} = 2$

22. Two pipes are being used to fill a tank. Pipe A can fill the tank 5.5 times as fast as pipe B. When both pipes are turned on, it takes 11 hours to fill the tank. How long would it take to fill the take if only pipe A were used? How about if only pipe B were used?

23. Town A and Town B are 580 miles apart. A boat traveled from Town A to town B, and then back to Town A. Since the river flows from Town B to Town A, the boat's speed was 30 miles per hour faster when it traveled from Town B to Town A. The whole trip took 29 hours. How fast was the boat going when traveling from town A to town B? How fast was the boat going when traveling from town B to town A?