1. True or False.
   
   a) There are times in which a function is not a relation
   b) All lines that are not vertical lines are functions.
   c) One of these does not represent slope; average rate of change, instantaneous rate of change, \( f'(x) \)

2. We say that a function \( f \) is continuous at \( x = 2 \) provided (make sure to use \( x = 2 \) in your answers)
   
   a) _____________________________
   b) _____________________________
   c) _____________________________

3. Prove that \( f(x) = \frac{x}{x - 1} \) is continuous at \( x = 2 \).

4. Which of these relations are also functions?
   
   a) _____________________________
   
   b) \( y = \log_4 x \)

   c) _____________________________

   d) _____________________________

   \( y^2 = \frac{x + 1}{4} \)

   the top part of a circle with radius 3, center at the origin represented by \( y = \sqrt{9 - x^2} \)
5. Find the domain of

a) the relation listed in problem #4a 

b) \( f(x) = \frac{x - 2}{x^2 - 3x + 2} \)

c) \( y = \log_4 x \rightarrow \) 

6. Graph each of the following – make sure to find the required items (graph and answer the questions)

a) \( 2x - y = 4 \rightarrow \) x-intercept: \( = \) _______ y-intercept: \( = \) _______ slope: \( = \) _______

b) \( g(x) = 2x^2 - 8x \rightarrow \) x-intercept: \( = \) _______ vertex: \( = \) _______

7. Find the points at which the following functions are discontinuous.

a) \( f(x) = \frac{x + 2}{5} \rightarrow \) 

b) \( g(x) = \frac{x^2 + 2x}{x + 2} \rightarrow \) 

c) \( h(x) = \frac{2x}{x^2 + 1} \) if \( x \geq 1 \) 

\( \rightarrow \) \( \) if \( x < 1 \)
8. What is the range of
   a) \( y = |2x - 6| \) → __________________________
   b) \( y = -2 \) → __________________________

9. What is the y-intercept of \( y = 4^x \)? → ________________

10. Given the following functions – answer the questions that follow.
    \( f(x) = \frac{x + 2}{x^2 - 4} = \frac{x + 2}{(x + 2)(x - 2)} \)  
    \( g(x) = \frac{x - 1}{x + 2} \) if \( x < 3 \)  
    \( t(x) = -4 \)

    a) \( f(2) = \) ____________  
    b) \( \lim_{x \to 2} f(x) = \) ________  
    c) \( \lim_{x \to 3} g(x) = \) ________

    c) \( g(0) = \) ____________  
    d) \( g(3) = \) ________  
    e) \( \lim_{x \to 3^+} g(x) = \) ________

    f) \( t(5) = \) ________  
    h) \( \lim_{x \to 3} t(x) = \) ____________

    i) the derivative of \( t(x) \) → \( t'(x) = \) ____________  
    j) the instantaneous rate of change of \( t(x) \) at \( x = 3 \)  
       \( I_{ic} = \) ____________
11. The average rate of change of \( f(x) \) as \( x \) changes from \( x = 1 \) to \( x = 3 \) can best be described by what ratio using the numbers listed here.

Write it out:

12. Find each of the following limits

a) \( \lim_{h \to 4} 3h = \) __________

b) \( \lim_{x \to 2} \frac{2}{3} = \) __________

c) \( \lim_{x \to \infty} 3x = \) __________

d) \( \lim_{x \to \infty} \frac{2}{x^2} = \) __________

e) \( \lim_{x \to -1} \frac{x}{x - 1} = \) __________

f) \( \lim_{x \to 3} \frac{x^2 - 2x - 3}{x - 3} = \) __________

g) \( \lim_{x \to \infty} \frac{x^2 + 2}{3x^2 + 4} = \) __________

h) \( \lim_{h \to 0} \frac{2x + h}{h} = \) __________

13. Find the derivative of each function

a) \( f(x) = 4x - 2x^3 \) \( \rightarrow f'(x) = \) __________

b) \( g(x) = (3x^2 + 2)(2 - 3x^3) \) \( \rightarrow g'(x) = \) __________

c) \( h(x) = \frac{3 - 2x}{4x + 5} \) \( \rightarrow h'(x) = \) __________
16. Use the following figure to answer the questions that follow.

![Graph Image]

a) \( f(2) = \) ____________

b) \( f(0) = \) ____________

c) at what \( x \) is \( f(x) = 2 \) → ____________

mark it on the graph

d) \( \lim_{{x \to \infty}} f(x) = \) ____________

e) \( f(-2) = ? \) ____________

f) at what \( x \)'s is the function not continuous? ____________

17. Let \( C(x) = 3x + 30 \) represent the cost of producing \( x \) items

\( R(x) = 5x - 60 \) represent the revenue generated by producing \( x \) items

a) Find the profit equation. Keep in mind that \( P(x) = R(x) - C(x) \)

b) Find the marginal cost.

c) Find the cost in producing 10 items.

18. What is the equation of

a) a line with slope 3 that passes through the point (2, -1). ____________

b) line that does has slope zero and passes through the point (-3, 4) ? ____________
19. Find \( x \) if
   
   a) \( x = 3^4 \)  
   b) \( \log_3 27 = x \)

20. You are given a function \( f(x) \) so that \( f'(x) = 5x \)

   Find the instantaneous rate of change at \( x = 4 \)  

21. Sketch the graph of

   \( y = |2 - 4x| \)

22. Show me a graph in which the instantaneous rate of change at \( x = 3 \) is zero.