1. Fill in the blank.

A ______________ is a group of objects that have a well-defined property in common.

The set of whole numbers when listed out is best represented by { ________________ }

A real number that is not rational must be ________________

2. Draw a rectangular coordinate system. Label the four quadrants properly and the x and y axes.

3. Use a rectangular coordinate system to sketch the graph of each of the following two functions.

   a) \( f(x) = 8 - 4x \)  
   b) \( g(x) = 2x^2 - 8x \)  
   c) \( y = |x + 2| \)

4. Find each of the following values – use the functions in #3.

   a) \( f(3) = \) __________
   b) \( g(c) = \) __________
   c) \( f(h + 2) = \) _______________ (simplest form)

5. Find the domain of each of the following functions.

   a) \( f(x) \) – from #3a
   b) \( y = \frac{x}{x^2 - 4} \)
6. Which of these represent functions and which represent only relations.

A

B

C

7. Show with some kind of example why \( y^2 = 2x \) is not a function.

8. What is the slope of the line \( 2x + 3y = 12 \)? ________________

Give the equation of a line that has undefined slope and passes through the point \((-2, 4)\). ________________

What is the x-intercept of \( f(x) = x^2 - 4x \)? ________________

9. Find \( x \)

\[ x = 4^2 \rightarrow x = \underline{_______} \]

\[ 1/9 = 3^x \rightarrow x = \underline{_______} \]

\[ \log_5 25 = x, \ x = \underline{_______} \]

10. Sketch the graph of

a) \( y = 4^x \)

b) \( y = \log_3 x \)

11. If \( C(x) = 4x - 2 \) and \( R(x) = 5x - 20 \), then what would be the profit equation? ________________

the marginal profit? _____
1. A function is said to be continuous provided
   a) ___________________   b) _________________  c) _____________________

2. We define the instantaneous rate of change of \( f(x) \) at \( x = x_0 \) by
   \[
   \lim_{h \to 0} \frac{f(x_0 + h) - f(x_0)}{h}.
   \]
   How do we define the derivative of \( f(x) \)?

3. Find the points of discontinuity of the following functions. If there are no points of discontinuity, then say “Continuous”
   a) \( f(x) = \frac{x}{x^2 + 4} \) → ______________________________
   
   b) \( f(x) = \frac{2x - 1}{x^2 + 4x} \) → ______________________________
   
   c) \( g(x) = \begin{cases} 
   3x - 1 & \text{if } x > 1 \\
   2x & \text{if } x \leq 1 
   \end{cases} \) → ______________________________

4. Find each of the following limits
   a) \( \lim_{x \to 3} f(x) = \) ___________ if \( f(x) = 2x + 2h \)

   b) \( \lim_{x \to 3} \frac{f(2 + h) - f(2)}{h} = \) ___________ if \( f(x) = 2 - 5x \)

5. Find the derivative of \( f(x) \) at \( x = -2 \) if
   a) \( f(x) = 2 \) → \( f'(x) = \) ___________, \( f'(-2) = \) ___________
   
   b) \( f(x) = 5x^2 \) → \( f'(x) = \) ___________, \( f'(-2) = \) ___________
1. Identify each of the following as a line, parabola, neither.

   a) \( f(x) = -3 \) → _________
   
   b) \( g(x) = x^3 + 2x - 3 \) → _________

2. Given \( h(x) = 2x^2 - 5x + 2 \) find each of the following.

   a) \( h(1) = \) __________
   
   b) \( h'(1) = \) __________
   
   c) \( h''(1) = \) __________
   
   d) the slope of the tangent line at the point \( (1, -1) \) → \( m = \) _________
   
   e) the equation of the tangent line at the point \( (1, -1) \) → __________________
   
   f) the critical points (possible max and min at \( x = ? \)) → \( x = \) ________________
   
   g) inflection point at \( x = \) _________

3. Sketch the graph of \( f(x) = ax^2 + bx + c \) by using the fact that \( f'(x) = 2x - 4 \) and \( f(x) \) has one critical value at \( x = 2 \).
   
   (Hint: antiderivative)

4. Find \( \frac{du}{dt} \) if \( u(t) = t^3 + 4t + h \) → \( \frac{du}{dt} = \) ______________

5. Find

   \[ \int (2x - 5)dx = \] _________

   \[ \int 6x \, dx = \] _________
Answers:

Long Quiz #1
1. Fill in the blank.

   A __**(SET)**__ is a group of objects that have a well-defined property in common.
   The set of whole numbers when listed out is best represented by \{ 0, 1, 2, 3, ... \}
   A real number that is not rational must be **Irrational**

2. Draw a rectangular coordinate system. Label the four quadrants properly and the x and y axes.

   ![Coordinate System Diagram]

3. Use a rectangular coordinate system to sketch the graph of each of the following two functions.

   a) \( f(x) = 8 - 4x \)
   b) \( g(x) = 2x^2 - 8x \)
   c) \( y = \left| x + 2 \right| \)

   **Find the x-intercept**: \( x = 2 \),
   **the y-intercept**: \( y = 8 \)
   **connect them and get a line**

4. Find each of the following values – use the functions in #3.

   a) \( f(3) = \) __________
   b) \( g(c) = \) __________

   \( f(3) = 8 - 4(3) = 8 - 12 = -4 \)

   \( g(c) = 2c^2 - 8c \)

   c) \( f(h + 2) = \) _______________ (simplest form)

   \( f(h + 2) = 8 - 4(h+2) = 8 - 4h - 8 = -4h \)

5. Find the domain of each of the following functions.

   a) \( f(x) \) – from #3a
   b) \( y = \frac{x}{x^2 - 4} \)

   **All real number**

   **All real numbers except x = 2, -2**
6. Which of these represent functions and which represent only relations.

A     B    C
Relation  Relation  Function

7. Show with some kind of example why \( y^2 = 2x \) is not a function.

\[
\text{if } x = 2 \rightarrow y^2 = 4 \rightarrow y = 2 \text{ or } y = -2 \rightarrow \text{ One produced two different values of } y.
\]

8. What is the slope of the line \( 2x + 3y = 12 \)? \( m = -\frac{2}{3} \)

Give the equation of a line that has undefined slope and passes through the point \((-2, 4)\). \( x = -2 \)

What is the x-intercept of \( f(x) = x^2 - 4x \)? \( x \text{ intercept: } x = 0, x = 4 \)

9. Find \( x \)

\[
x = 4^2 \rightarrow x = 16 \quad 1/9 = 3^x \rightarrow x = \frac{1}{2} \quad \log_5 25 = x, \quad x = 2
\]

10. Sketch the graph of \( \text{LOOK at NOTES} \)

a) \( y = 4^x \)

b) \( y = \log_3 x \)

11. If \( C(x) = 4x - 2 \) and \( R(x) = 5x - 20 \), then what would be the profit equation? \( P(x) = R(x) - C(x) = (5x - 20) - (4x - 2) = x - 18 \)

\( \text{marginal profit: slope of } P(x) = 1 \)
Long Quiz #2

1. A function is said to be continuous at \( x = c \) provided

   a) ___________________   b) _________________  c) _____________________
   \( f(c) \) exists            \( \lim_{x \to c} f(x) \) exists    \( f(c) = \lim_{x \to c} f(x) \)

2. We define the instantaneous rate of change of \( f(x) \) at \( x = x_0 \) by

   \[ I_{rc} = \lim_{h \to 0} \frac{f(x_0 + h) - f(x_0)}{h}. \]

   How do we define the derivative of \( f(x) \)?

   \[ \text{answer: } f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \]

3. Find the points of discontinuity of the following functions. If there are no points of discontinuity, then say “Continuous”

   a)    \[ f(x) = \frac{x}{x^2 + 4} \]  \( \rightarrow \) __________________________

   None: \( x^2 + 4 \neq 0 \) for any real numbers.

   b)    \[ f(x) = \frac{2x - 1}{x^2 + 4x} \]  \( \rightarrow \) __________________________

   \( x^2 + 4x = 0 \)  \( \rightarrow \) \( x(x + 4) = 0 \)  \( \rightarrow x = 0 \) ,  \( x = -4 \)

   Discontinuous at \( x = 0 \) and \( x = -4 \)

   c)    \[ g(x) = \begin{cases} 
   3x - 1 & \text{if } x > 1 \\
   2x & \text{if } \leq 1 
\end{cases} \]

   \( \rightarrow \) __________________________

   The only point in question should be \( x = 1 \).

   \( \lim_{x \to 1} g(x) \) exists = 2, \( f(1) = 2 \), So it is cont. at \( x = 1 \)

   \( x \rightarrow 1 \)

   Note: to find the limit \( \rightarrow \) you have to find left and right limits

4. Find each of the following limits

   a)    \( \lim_{x \to 3} f(x) = \) ____________ if \( f(x) = 2x + 2h \)  \( \rightarrow \) answer: \( 6 + 2h \).

   b)    \( \lim_{x \to 3} \frac{f(2 + h) - f(2)}{h} = \) ____________ if \( f(x) = 2 - 5x \)  \( \rightarrow \) answer: \( I_{rc} = -5 \)

5. Find the derivative of \( f(x) \) at \( x = -2 \) if

   a)    \( f(x) = 2 \rightarrow f'(x) = \) ____________,   \( f'(-2) = \) ____________  \( \rightarrow \) answers: \( f'(x) = 0 \) and \( f'(-2) = 0 \)

   b)    \( f(x) = 5x^2 \rightarrow f'(x) = \) ____________,   \( f'(-2) = \) ____________  \( \rightarrow \) answers: \( f'(x) = 10x \) and \( f'(-2) = -20 \)