Math 1302

1. Find

   $0 \times 5 = \underline{\hspace{1cm}}$   $5^2 = \underline{\hspace{1cm}}$   $3 + 2 (4 + 2) = \underline{\hspace{1cm}}$

2. How many terms does $2x^2 y$ have? _______________

3. $x^2 \ast x^4 = \underline{\hspace{1cm}}$

4. $\frac{x^{10}}{x^4} = \underline{\hspace{1cm}}$

5. $(x + 2) (x - 3) = \underline{\hspace{1cm}}$

7. Find the solution of

   $x + 2 = -1 \rightarrow x = \underline{\hspace{1cm}}$

   $x/3 = 1/4 \rightarrow x = \underline{\hspace{1cm}}$
1. What is
   a) the smallest natural number? ___________________

   b) the smallest prime number? ____________________

   c) the GCF of 24 and 30? ______________

   d) the absolute value of $1 - 2\pi \rightarrow |1 - 2\pi| =$ ______________ (exact solution)

   e) the LCM of 8 and 12 $\rightarrow$ ____________

2. Find the prime factorization of 120 (write as a product of prime factors) $\rightarrow$ 120 = ____________

3. Give me an example of
   a) the commutative law of addition $\rightarrow$ _____________________

   b) the associative law of multiplication $\rightarrow$ _____________________

4. Complete by using the distributive law
   a) $2(x - ay) =$ _____________________

   b) $- (x - 2 + y) =$ _____________________

5. If 0 is called the additive identity of the real numbers, what is the multiplicative identity? __________

6. If $x$ and $\frac{1}{x}$ are called multiplicative inverses (reciprocals), then what is the additive inverse of $\left( -\frac{3}{7} \right)$? __________
1. Find each of the absolute values

   a) \(|5 - 2\pi| = \) \(\underline{\quad} \)  
   b) \(|3 + \sqrt{3}| = \) \(\underline{\quad} \)  
   c) \(|c^4| = \) \(\underline{\quad} \)  

2. Use a number line to plot

   a) \(x < 3\)  
   b) \(x \geq 4\)  

3. Evaluate if \(x = -1\), \(y = -2\), and \(z = 0\)

   a) \(x^z = \) \(\underline{\quad} \)  
   b) \(xyz = \) \(\underline{\quad} \)  
   c) \(\frac{x-y}{x+y} = \) \(\underline{\quad} \)  

4. Simplify by using the rules of exponents.

   a) \(-4^0 = \) \(\underline{\quad} \)  
   b) \(0^2 = \) \(\underline{\quad} \)  
   c) \(4^{-2} = \) \(\underline{\quad} \)  
   d) \((-2/3)^2 = \) \(\underline{\quad} \)  

5. More exponents

   a) \(x^6 \cdot x^3 = \) \(\underline{\quad} \)  
   b) \((5x^3)^2 = \) \(\underline{\quad} \)  
   c) \((2xy^2)^2 \div (6x^2y^3) = \) \(\underline{\quad} \)
1. Simplify by using the rules of exponents. All exponents should be nonnegative.
   a) \( x^{2/3} \cdot x^{1/4} = \) __________
   b) \( x^{1/2} \div x^{1/3} = \) __________
   c) \( (16x^4y^8)^{1/4} = \) ________________

   a) \( -4^{1/2} = \) __________
   b) \( (-8)^{1/3} = \) ______________
   c) \( 64^{-1/5} = \) ____________

3. Find the
   a) two square roots of 25 (if any) → ________________
   b) cube roots of (-8) if any → ________________

4. Simplify the following radical problems.
   a) \( \sqrt{16x^8} = \) ________________
   b) \( \sqrt{-64} = \) ________________
   c) \( \sqrt[3]{-8x^6} = \) ________________
Simplify by using the rules of exponents and radicals.

1. $16^{\frac{1}{4}} = \underline{\phantom{0000}}$  

2. $4^{-\frac{1}{2}} = \underline{\phantom{0000}}$

3. $\sqrt[3]{16} = \underline{\phantom{0000}}$

4. $\sqrt[3]{81} = \underline{\phantom{0000}}$

5. $\sqrt[3]{54} = \underline{\phantom{0000}}$

6. $\sqrt[4]{x^8 y^{12}} = \underline{\phantom{0000}}$

7. $3 + 2\sqrt{4} = \underline{\phantom{0000}}$

8. $\sqrt[4]{\frac{4}{2x}} = \underline{\phantom{0000}}$

9. $\frac{4}{\sqrt{2x^2}} = \underline{\phantom{0000}}$

10. $\sqrt[4]{64x^6 y^{10}} = \underline{\phantom{0000}}$
1. Find the product of
   a) \((x + 2y)^2 = \) _____________________
   b) \((3x - 2y)(3x + 2y) = \) _____________________

2. Factor completely.
   a) \(3 + 9x = \) _____________________
   b) \(x^2 - 16y^2 = \) _____________________
   c) \(9 + x^2 = \) _____________________
   d) \(x(y - 3) + z(y - 3) = \) ______________

   a) \(16 - x^4 = \) _____________________
   b) \(4x - x^3 = \) _____________________
   c) \(x^2 + 10x + 25 = \) _____________________
   d) \(x^3 + 4x^2 + 4x = \) _____________________
1. True or False
   
   ________  a) All polynomials factor

   ________  b) $x^2 + 9$ is prime

   ________  c) $\frac{x-1}{x+1} = -1$

   ________  d) $\sqrt{0.4} = 0.2$

2. The first method you should try to use when factoring? _____________________________

3. Last method you should try to use when factoring? _____________________________

4. How many people sit on the front row?

5. How many people sit on the back row?

6. The smallest even prime number?

7. Exam day?
Factor.

1. \( x^2 + 5x = \) ________________

2. \( x^2 - 4 = \) ________________

3. \( x^3 + 27 = \) ________________

4. \( x^2 + 2x - 24 = \) ________________

5. \( 2x^2 - 7x + 3 = \) ________________

6. \( x(y + 1) - x(x - 1) = \) ________________

7. \( xy - y - x^2 + x = \) ________________

8. \( x^2 - (y^2 + 4y + 4) = \) ________________
Simplify each of the following by performing the given operation and reducing to simplest terms.

1. \( \frac{x^2 + 3x}{x^2 - 9} = \)  
2. \( \frac{x^2 + 5x + 4}{x^2 + 3x - 4} = \)

3. \( \frac{3 - 2x}{x - 2} - \frac{1 - x}{x - 2} = \)

4. \( \frac{2 - x}{x^2 - 4} - \frac{x + 4}{x^2 - 4} = \)

5. \( \frac{x^2 + 2x + 1}{x^2 - 1} \div \frac{x^2 + x}{x^2} = \)

6. \( 1 - \frac{1}{2 + x} = \)
1. Write the following quadratic equations in standard form and find the values of a, b, and c.
   a) \(1 + 2x = x^2\) → \(\_______________\) \(a = \____\) \(b = \____\) \(c = \____\)
   b) \(3x^2 = 2\) → \(\_______________\) \(a = \____\) \(b = \____\) \(c = \____\)

2. Find the solution of each of the following equations.
   a) \(\frac{x - 2}{3} - \frac{x + 3}{2} = 1\)

   b) \(2 - \frac{x - 1}{2} = \frac{1}{4}\)

   c) \(\frac{2}{x + 2} = \frac{3}{x - 2}\)

   d) \(1 + x(1 + x) = x^2\)

2. Is \(x = -2\) a solution of the equation \(x^2 - 4x - 4 = 0\)? SHOW WORK!

3. What are four simple values of \(i^0\)? \(i^1 = \____\) \(i^2 = \____\) \(i^3 = \____\) \(i^4 = \____\)

4. Find \(i^{39}\) in simplest form.

5. Find \((2 + 3i) + (5 - 2i)\). \(\_______________\)

   If \(i^2 = -1\), then find \((1 + 2i)^2 = \_______________\)
1. Write the following quadratic equations in standard form and find the values of a, b, and c.

   a) \( 1 + 2x = x^2 \) → __________________________ a= ___ b= _____ c= _____

   b) \( 3x^2 = 2 \) → __________________________ a= ___ b= _____ c= _____

2. Find the solution of each of the following equations.

   a) \( \frac{x - 2}{3} - \frac{x + 3}{2} = 1 \)

   b) \( 2 - \frac{x - 1}{2} = \frac{1}{4} \)

   c) \( \frac{2}{x + 2} = \frac{3}{x - 2} \)

   d) \( 1 + x(1 + x) = x^2 \)

2. Is \( x = -2 \) a solution of the equation \( x^2 - 4x - 4 = 0 \)? SHOW WORK!

3. What are four simple values of \( i^n \)?
   
   \( i^1 = _____ \) \( i^2 = _____ \) \( i^3 = _____ \) \( i^4 = _____ \)

4. Find \( i^{39} \) in simplest form.

5. Find \( (2 + 3i) + (5 - 2i) \). __________________________
   
   If \( i^2 = -1 \), then find \( (1 + 2i)^2 = \) __________________________
Find the solution of each of the following equations.

1. \(3 - 2x = 0\)

2. \(x^2 = 4x\)

3. \(x^2 + 4 = 0\)

4. \(x^2 - 4x - 5 = 0\)

5. \((x + 2)^2 = 12\)
1. State the quadratic formula used to solve equations of the form \( ax^2 + bx + c = 0 \)

2. What is
   a) the real part of \(-4 + 3i\) \(\Rightarrow\) ______
   b) the imaginary part of \(4 - 5i\) \(\Rightarrow\) ______
   c) the conjugate of \(-4 + 3i\) \(\Rightarrow\) ______
   d) the conjugate of \(-2i\) \(\Rightarrow\) ______
   e) the modulus, the absolute value, of \(-12 + 5i\) \(\Rightarrow\) _________________________

3. Plot \(4 - 3i\) on the complex plane. Label the axes.

4. Simplify each of the following by performing the given property and writing in simplest form.
   c) \((2 + 3i) / (3 - 2i) = \) __________

5. Find the solution by any method
   c) \(4x^2 - 2x + 1 = 0\)  
   d) \(x + 1/x + 2 = 0\)

7. Solve by competing the square. No other method will do.
   a) \(x^2 + 4x + 4 = 9\)
1. $\sqrt{x} = -1$

2. $\sqrt{x + 2} = 3$

3. $\sqrt{1-x} = 1-x$

4. Write down the quadratic formula.

5. Solve by completing the square.
   
   $2x^2 + 3x + 1 = 0$

6. Solve by any method
   
   a) $x^2 = 4x$

   b) $3x^2 + 12 = 0$

   c) $x^4 - 3x^2 - 4 = 0$
1. Which of these are functions? _________________________
   Which are relations? __________________________
   a)          b) 
   c)          d) 

2. What is the domain of
   a)         b) 
   c) 

3. What is the range of
   a)         b) 

4. Complete the table and graph
   a)  \( y = 2x - 4 \)
1. Find the slope of the line
   a) \( y = -3 \) → \( m = \) _________
   b) \( 2x - y = 3 \) → \( m = \) _________

2. What is the equation of the line that
   a) passes through the points (3, -2) and (-5, -4) → ______________________
   b) has an undefined slope and passes through the point (-3, 1) ______________

3. What is the vertex of the parabola
   a) \( y = -x^2 + 6x + 8 \) → \( V \) __________
   b) \( y = 4x^2 - 16 \) → \( V \) __________

4. Sketch the graph of
   a) \( y = 4x^2 - 16 \)
   b) \( f(x) = |x - 2| \)

5. If \( f(x) = x^2 + 2 \) and \( g(x) = -2x \), find \( f + g \) (2). __________ and \( f \circ g \) (2). __________

6. If \( h(x) = 2^x \), find \( h(1) \). ______

7. What is the domain of \( y = \sqrt{x^2 + 2x} \)
1. Find \( x \) if
   
   a) \( x = 2^4 \rightarrow x = \) ________  
   b) \( 27 = (1/3)^x \rightarrow x = \) ________  
   
   c) \( \log_{4} \frac{1}{4} = x \rightarrow x = \) ________  
   d) \( \log x = 0.01 \)  

2. What is the  
   
   a) \( x \)-intercept of \( y = 4^x \rightarrow \) ____________  
   b) \( y \)-intercept of \( y = -2^x \rightarrow \) ____________  

3. What is the domain of \( y = \log_{4} x \) ? \( \rightarrow \) _____________________________________________________________________  

4. What is the range of \( f(x) = 4^x \) ? \( \rightarrow \) _____________________________________________________________________  

5. Find \( \log_b x \) if  
   
   \( \log_b x^2 = 0.242 \rightarrow x = \) ________________  

6. What is the domain of \( y = \log (x^2 - 3x) \)  

7. Find the solution of the equation \( \log (x - 2) - \log (x + 2) = 0 \)
1. Find $283 \div 12$. Write in proper form $\rightarrow 283 \div 12 = \underline{\phantom{00}}$

2. What is the remainder of \((x^2 + 2) \div (x + 1)\) ? remainder $= \underline{\phantom{00}}$

   What about the remainder of \((2x^3 - 2x + 1) \div (x - 1)\) ? $\underline{\phantom{00}}$

3. Is \((x - 2)\) a factor of $x^4 - 7x - 2$? Show work! $\underline{\phantom{00}}$

4. If $x + 2$ is a factor of $x^3 + 5x - 2$, then factor $x^3 - 5x - 2$. $\underline{\phantom{00}}$

5. It is known that $x^3 + 8 = 0$ has three roots (solutions) - find them.
1. Construct the next two lines of Pascal’s Triangle

\[
\begin{array}{cccc}
\text{1} \\
1 & 1 \\
1 & 2 & 1 \\
\end{array}
\]

2. Use \textbf{synthetic division} to find the \textbf{remainder} of \((x^3 + 2x + 1) \div (x + 1)\).

3. Use synthetic division to find the answer to (\textbf{Proper form is required})
\[\frac{x^3 + 5x - 1}{x - 2} = \] ________________

4. Use synthetic division and the quadratic formula to find all of the roots of \(x^3 + 2x + 3 = 0\)
(\textbf{HINT:} \(x + 1\) is a factor)

5. How many positive roots does \(x^5 + 4x^3 + 2x^2 + 2 = 0\) have? _________

Why?

6. How many roots does \(x^4 - 16 = 0\) have? _________

What are they?

7. Find all of the rational numbers that should be tested to find the rational roots of \(2x^3 + 4x^2 - x + 5 = 0\)

8. Find the first and second terms of the expansion of \((x + 1/x)^5 \to \) ________________
Quiz #1 – Answers

1. What is
   a) the smallest natural number? ________________ ans. 1
   b) the smallest prime number? ________________ ans. 2
   c) the GCF of 24 and 30? ____________ ans. 6
   d) the absolute value of $1 - 2\pi$ → $|1 - 2\pi| = ______________$ (exact solution) ans. $2\pi - 1$
   e) the LCM of 8 and 12 → ________________ ans. 24

2. Find the prime factorization of 120 (write as a product of prime factors) → 120 = ____________
   answer: $120 = 10 \times 12 = 2 \times 5 \times 2 \times 2 \times 3 = 2^3 \times 3^1 \times 5^1$

3. Give me an example of
   a) the commutative law of addition → ________________ ans.: $3 + 4 = 4 + 3$
   b) the associative law of multiplication → ________________ ans.: $(3 \times 4) \times 5 = 3 \times (4 \times 5)$

4. Complete by using the distributive law
   a) $2(x - ay) =$ ________________ ans.: $2(x - ay) = 2x - 2ay$
   b) $-(x - 2 + y) =$ ________________ ans.: $-(x - 2 + y) = -x + 2 - y$

5. If 0 is called the additive identity of the real numbers, what is the multiplicative identity? _______ ans.: 1

6. If x and 1/x are called multiplicative inverses (reciprocals), then what is the additive inverse of $(-3/7)$? _______ ans.: $3/7$
Quiz #2 - Answers

1. Find each of the absolute values
   a) $|5 - 2\pi| =$ _______________  
      \text{ans.:} \ 2\pi - 5 
   b) $|3 + \sqrt{3}| =$ _______________  
      \text{ans.:} \ 3 + \sqrt{3} 
   c) $|c^d| =$ _______________  \ ans.: \ c^d 

2. Use a number line to plot
   a) $x < 3$ 
   
      \begin{array}{c}
      \hline
      \text{0} \\
      \hline
      \end{array}
   
   b) $x \geq 4$ 

\begin{array}{c}
\hline
\text{0} \\
\hline
\end{array}

3. Evaluate if $x = -1$, $y = -2$, and $z = 0$
   a) $x^z =$ __________ \ \text{ans.:} \ (-1)^0 = 1 
   b) $xyz =$ _______________ \ \text{ans.:} \ (-1)(-2)(0) = 0 
   
   c) $\frac{x - y}{x + y} =$ __________ \ \text{ans.:} \ \frac{(-1) - (-2)}{(-1) + (-2)} = \frac{1}{-3} = -\frac{1}{3} 

4. Simplify by using the rules of exponents.
   a) $-4^0 =$ __________ \ \text{ans.:} -1 
   b) $0^5 =$ __________ \ \text{ans.:} 0 
   c) $4^{-2} =$ __________ \ \text{ans.:} 1/16 
   d) $(-2/3)^2 =$ __________ \ \text{ans.:} 9/4 \text{ or } 2\frac{1}{4} 

5. More exponents
   a) $x^6 \cdot x^3 =$ __________ \ \text{ans.:} x^9 
   b) $(5x^3)^2 =$ __________ \ \text{ans.:} 25x^6 
   c) $(2xy^2)^3 \div (6x^2y^3) =$ __________ 

      \text{Corrected answer:} \ \frac{4x^2y^4}{6x^2y^3} = \frac{2y}{3}
1. Simplify by using the rules of exponents. All exponents should be nonnegative.
   a) \( x^{2/3} \cdot x^{1/4} = \ __________ \)
   b) \( x^{1/2} \div x^{1/3} = \ ____________ \)
   \[ \text{ans.: } x^{2/3 + 1/4} = x^{11/12} \]
   \[ \text{answer: } x^{1/2 - 1/3} = x^{1/6} \]
   c) \( (16x^4y^8)^{1/4} = \ _______________ \)
   \[ \text{answer: } 16^{1/4}x^{4/4}y^{8/4} = 2xy^2 \]

   a) \(-4^{1/2} = \ ____________ \)
   b) \((-8)^{1/3} = \ ______________ \)
   \[ \text{answer: } -\sqrt{4} = -2 \]
   \[ \text{answer: } \sqrt[3]{-8} = -2 \]
   c) \(64^{-1/5} = \ _____________ \)
   \[ \text{answer: } \text{I meant to write } 64 - \frac{1}{6} = \frac{1}{\sqrt[5]{64}} = \frac{1}{2} \]

3. Find the
   a) two square roots of \(25\) (if any) \(\rightarrow\) \____________________ \ \[ \text{answer: } 5 \text{ and } -5 \]
   b) cube roots of \((-8)\) if any \(\rightarrow\) \___________________ \ \[ \text{answer: } -2 \text{ is the only cube root of } -8 \]

4. Simplify the following radical problems.
   a) \(\sqrt[5]{16x^8} = \ ________________ \) \ \[ \text{answer: } 4x^4 \]
   b) \(\sqrt{-64} = \ ________________ \) \ \[ \text{answer: no real root} \]
   c) \(\sqrt[3]{-8x^6} = \ ________________ \) \ \[ \text{answer: } -2x^2 \]
Simplify by using the rules of exponents and radicals.

1. $16^{\frac{1}{4}} = \underline{2}$
   
   2. $4^{-\frac{3}{2}} = \underline{\frac{1}{2}}$

   answer: 2

   answer: 1/2

3. $\sqrt[3]{16} = \underline{2}$

   4. $\sqrt[3]{81} = \underline{3}$

   answer: $\sqrt[3]{4}$

   answer: 3

5. $\sqrt[3]{-54} = \underline{-3\sqrt[3]{2}}$

   6. $\sqrt[3]{x^8y^{12}} = \underline{x^2y^3}$

   answer: $-3\sqrt[3]{2}$

   answer: $x^2y^3$

7. $3 + 2\sqrt{4} = \underline{7}$

   8. $\sqrt[4]{\frac{4}{2x}} = \underline{\frac{\sqrt{2x}}{x}}$

   answer: 7

   answer: $\frac{\sqrt{2x}}{x}$

9. $\frac{4}{\sqrt[4]{2x^2}} = \underline{\frac{2\sqrt{4x}}{x}}$

   10. $\sqrt[4]{64x^6y^{10}} = \underline{2xy^2\sqrt{2xy}}$

   answer: $\frac{2\sqrt{4x}}{x}$

   answer: $2xy^2\sqrt{2xy}$
1. Find the product of
   a) \((x + 2y)^2 = \) __________________________  \textit{answer:} \(x^2 + 4xy + 4y^2\)

   b) \((3x - 2y)(3x + 2y) = \) ______________________  \textit{answer:} \(9x^2 - 4y^2\)

2. Factor completely.
   a) \(3 + 9x = \) _____________________  \textit{answer:} \(3(1 + 3x)\)

   b) \(x^2 - 16y^2 = \) __________________________  \textit{answer:} \((x - 4y)(x + 4y)\)

   c) \(9 + x^2 = \) ___________________________  \textit{answer:} Prime – does not factor any further

   d) \(x(y - 3) + z(y - 3) = \) _______________  \textit{answer:} \((y - 3)(x + z)\)

   a) \(16 - x^4 = \) __________________________  \textit{answer:} \((4 - x^2)(4 + x^2) = (2 - x)(2 + x)(4 + x^2)\)

   b) \(4x - x^3 = \) ___________________________  \textit{answer:} \(x(4 - x^2) = x(2 - x)(2 + x)\)

   c) \(x^2 + 10x + 25 = \) ________________________  \textit{answer:} \((x + 5)(x + 5) = (x + 5)^2\)

   d) \(x^3 + 4x^2 + 4x = \) _________________________  \textit{answer:} \(x(x^2 + 4x + 4) = x(x + 2)(x + 2) = x(x + 2)^2\)
1. True or False

- a) All polynomials factor  
  **answer: false**

- b) $x^2 + 9$ is prime  
  **answer: true**

- c) $\frac{x-1}{x+1} = -1$  
  **answer: false**

- d) $\sqrt{0.4} = 0.2$  
  **answer: false**

2. The first method you should try to use when factoring? _____________________________  

  **answer: GCF**

3. Last method you should try to use when factoring? __________________  

  **answer: grouping**

4. How many people sit on the front row?  
   answer: when everybody is present → **answer: six**

5. How many people sit on the back row?  
   **answer: one**

6. The smallest even prime number?  
   **answer: two**

7. Exam day?  
   **Answer: Thursday**
1. \(x^2 + 5x = \) ________________________  answer:  \(x(x + 5)\)

2. \(x^2 - 4 = \) ________________________  answer:  \((x-2)(x+2)\)

3. \(x^3 + 27 = \) ________________________  answer:  \((x + 3)(x^2 - 3x + 9)\)

4. \(x^2 + 2x - 24 = \) ________________________  answer:  \((x + 6)(x - 4)\)

5. \(2x^2 - 7x + 3 = \) ________________________  answer:  \((2x - 1)(x - 3)\)

6. \(x(y + 1) - y(y + 1) = \) ________________________  answer:  \((y + 1)(x - y)\)

7. \(xy - y - x^2 + x = \) ________________________  answer:  \(y(x - 1) - x(x - 1) = (x - 1)(y - x)\)
   if you did not change the problem and left it as \(xy - y - x^2 - x\),
   then you have a PRIME polynomial

8. \(x^2 - (y^2 + 4y + 4) = \) ________________________  answer:  \(x^2 - (y + 2)^2 = (x - (y + 2))(x + (y + 2)) = (x - y - 2)(x + y + 2)\)
Simplify each of the following by performing the given operation and reducing to simplest terms.

1. \( \frac{x^2 + 3x}{x^2 - 9} = \) \[ \text{answer: } \frac{x(x + 3)}{(x - 3)(x + 3)} = \frac{x}{x - 3} \]

2. \( \frac{x^2 + 5x + 4}{x^2 + 3x - 4} = \) \[ \text{answer: } \frac{(x + 4)(x + 1)}{(x + 4)(x - 1)} = \frac{x + 1}{x - 1} \]

3. \( \frac{3 - 2x}{x - 2} - \frac{1 - x}{x - 2} = \) \[ \text{answer: } \frac{(3 - 2x) - (1 - x)}{x - 2} = \frac{3 - 2x - 1 + x}{x - 2} = \frac{-x + 2}{x - 2} = \frac{-(x - 2)}{x - 2} = -1 \]

4. \( \frac{2 - x}{x^2 - 4} - \frac{x + 4}{x^2 - 4} = \) \[ \text{answer: } \frac{(2 - x) - (x + 4)}{(x - 2)(x + 2)} = \frac{2 - x - x - 4}{(x - 2)(x + 2)} = \frac{-2 - 2x}{(x - 2)(x + 2)} \]
   or \[ \frac{-2(x + 1)}{(x - 2)(x + 2)} \]

5. \( \frac{x^2 + 2x + 1}{x^2 - 1} \div \frac{x^2 + x}{x^2} = \) \[ \text{answer: } \frac{(x + 1)(x + 1)}{(x - 1)(x + 1)} \cdot \frac{x^2}{x(x + 1)} = \frac{x^2}{x - 1} \]

6. \( 1 - \frac{1}{2 + x} = \) \[ \text{answer: } \frac{2 + x}{2 + x} - \frac{1}{2 + x} = \frac{2 + x - 1}{2 + x} = \frac{1 + x}{2 + x} \]
1. Write the following quadratic equations in standard form and find the values of a, b, and c.

   a) \(1 + 2x = x^2\) → __________________________ a= ____ b= _____ c= _____

   answer: \(x^2 - 2x + 1 = 0\) → \(a= 1, \ b = -2, \ c = -1\)

   b) \(3x^2 = 2\) → __________________________ a= ____ b= _____ c= _____

   answer: \(3x^2 -2 = 3x^2 + 0x – 2 = 0\) → \(a = 3, \ b = 0, \ c = -2\)

2. Find the solution of each of the following equations.

   a) \(\frac{x - 2}{3} - \frac{x + 3}{2} = 1\) answer: \(2(x-2) - 3(x + 3) = 6 (1) \rightarrow 2x - 4 - 3x - 9 = 6 \rightarrow x = -19\)

   b) \(2 - \frac{x - 1}{2} = \frac{1}{4}\) answer: \(8 - 2x + 2 = 1 \rightarrow -2x = -9 \rightarrow x = 9/2\)

   c) \(\frac{2}{x+2} = \frac{3}{x-2}\) → answer: \(2(x-2) = 3(x + 2 )\) with \(x \neq 2\) or \(-2\) → \(2x - 4 = 3x + 6 \rightarrow x = -10\)

   d) \(1 + x(1+x) = x^2\) → answer: \(1 + x + x^2 = x^2 \rightarrow 1 + x = 0 \rightarrow x = -1\)

2. Is \(x = -2\) a solution of the equation \(x^2 - 4x - 4 = 0\)? SHOW WORK!

   answer: with \(x = -2 \rightarrow (-2)^2 - 4(- 2) - 4 = ? \rightarrow 0 ? 4 + 8 - 4 = 8 \neq 0 \rightarrow not a solution !\)

3. What are four simple values of \(i^n\)? \(i^1 = \) _______  \(i^2 = \) _______  \(i^3 = \) _______  \(i^4 = \) _______

   answer: \(i, \ -1, \ -i, \ 1\)

4. Find \(i^{39}\) in simplest form. answer: \(39 ÷ 4 = 9 \text{ remainder } 3 \rightarrow i^{39} = i^3 = -i\)

5. Find \((2 + 3i) + (5 - 2i)\). ________________ answer: \(7 + i\)

   If \(i^2 = -1\), then find \((1 + 2i)^2\) = __________________ answer: \(1 + 4i + 4i^2 = 1 + 4i - 4 = -3 + 4i\)
Find the solution of each of the following equations.

1. \(3 - 2x = 0\)
   
   \[\text{answer: } x = \frac{3}{2}\]

2. \(x^2 = 4x\)
   
   \[\text{answer: } x^2 - 4x = 0 \rightarrow x(x - 4) = 0 \rightarrow x = 0 \text{ or } x = 4\]

3. \(x^2 + 4 = 0\)
   
   \[\text{answer: } x^2 = -4 \rightarrow x = \pm 2i\]

4. \(x^2 - 4x - 5 = 0\)
   
   \[\text{answer: } (x - 5)(x + 1) = 0 \rightarrow x = 5 \text{ or } x = -1\]

5. \((x + 2)^2 = 12\)
   
   \[\text{answer: } x + 2 = \pm \sqrt{12} = -2 \pm 2\sqrt{3}\]
1. Write the following quadratic equations in standard form and find the values of a, b, and c.

   a) \(1 + 2x = x^2\) → ____________________________ a= ____ b= _____ c= _____

   \[\text{answer: } x^2 - 2x + 1 = 0 \rightarrow a = 1, \ b = -2, \ c = -1\]

   b) \(3x^2 = 2\) → ____________________________ a= ____ b= _____ c= _____

   \[\text{answer: } 3x^2 - 2 = 3x^2 + 0x - 2 = 0 \rightarrow a = 3, \ b = 0, \ c = -2\]

2. Find the solution of each of the following equations.

   a) \(\frac{x - 2}{3} - \frac{x + 3}{2} = 1\) answer: \(2(x - 2) - 3(x + 3) = 6 (1) \rightarrow 2x - 4 - 3x - 9 = 6 \rightarrow x = -19\)

   b) \(2 - \frac{x - 1}{2} = \frac{1}{4}\) answer: \(8 - 2x + 2 = 1 \rightarrow -2x = -9 \rightarrow x = 9/2\)

   c) \(\frac{2}{x + 2} = \frac{3}{x - 2}\) → answer: \(2(x - 2) = 3(x + 2) \) with \(x \neq 2\) or \(-2\) → \(2x - 4 = 3x + 6 \rightarrow x = -10\)

   d) \(1 + x(1 + x) = x^2\) → answer: \(1 + x + x^2 = x^2 \rightarrow 1 + x = 0 \rightarrow x = -1\)

2. Is \(x = -2\) a solution of the equation \(x^2 - 4x - 4 = 0\)? SHOW WORK!

   \[\text{answer: with } x = -2 \rightarrow (-2)^2 - 4(-2) - 4 =? \ 0 \ ? \ 4 + 8 - 4 = 8 \neq 0 \rightarrow \text{not a solution!}\]

3. What are four simple values of \(i^n\)? \(i^1 = \) _______ \(i^2 = \) _______ \(i^3 = \) _______ \(i^4 = \) _______

   \[\text{answer: } i, \ -1, \ -i, \ 1\]

4. Find \(i^{39}\) in simplest form. \[\text{answer: } 39 \div 4 = 9 \text{ remainder } 3 \rightarrow i^{39} = i^3 = -i\]

5. Find \((2 + 3i) + (5 - 2i)\). \[\text{answer: } 7 + i\]

   If \(i^2 = -1\), then find \((1 + 2i)^2\). \[\text{answer: } 1 + 4i + 4i^2 = 1 + 4i - 4 = -3 + 4i\]
Find the solution of each of the following equations.

1. $3 - 2x = 0$
   
   answer: $x = 3/2$

2. $x^2 = 4x$
   
   answer: $x^2 - 4x = 0 \rightarrow x(x - 4) = 0 \rightarrow x = 0$ or $x = 4$

3. $x^2 + 4 = 0$
   
   answer: $x^2 = -4 \rightarrow x = \pm 2i$

4. $x^2 - 4x - 5 = 0$
   
   answer: $(x - 5)(x + 1) = 0 \rightarrow x = 5$ or $x = -1$

5. $(x + 2)^2 = 12$
   
   answer: $x + 2 = \pm \sqrt{12} = -2 \pm 2\sqrt{3}$
1. State the quadratic formula used to solve equations of the form \( ax^2 + bx + c = 0 \)

   \[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

2. What is
   a) the real part of \(-4 + 3i\) \(\Rightarrow\) \(\text{answer: } -4\)
   b) the imaginary part of \(4 - 5i\) \(\Rightarrow\) \(\text{answer: } -5\)
   c) the conjugate of \(-4 + 3i\) \(\Rightarrow\) \(\text{answer: } -4 - 3i\)
   d) the modulus, the absolute value, of \(-12 + 5i\) \(\Rightarrow\) \(\text{answer: } \sqrt{(-12)^2 + 5^2} = 13\)

3. Plot \(4 - 3i\) on the complex plane. Label the axes.
   \(\text{answer: plot the point } (4, -3),\)
   \(\text{construct an arrow from the origin to the point } (4, -3)\) that’s the number 4-3i

4. Simplify each of the following by performing the given property and writing in simplest form.
   c) \(\frac{2 + 3i}{3 - 2i} = \frac{2 + 3i}{3 - 2i} \cdot \frac{3 + 2i}{3 + 2i} = \frac{6 + 4i + 9i + 6i^2}{9 - 4i^2} = \frac{13i}{13} = i\)

5. Find the solution by any method
   c) \(4x^2 - 2x + 1 = 0\)
   \(a = 4, b = -2, c = 1\)
   \(\text{answer: } x^2 + 2x + 1 = 0\)
   \(x = 1\) or \(-1\)

6. Solve by competing the square. No other method will do.
   \(x^2 + 4x + 4 = 9 \rightarrow x^2 + 4x = 9 - 4 = 5 \rightarrow x^2 + 4x + (2)^2 = 5 + 4\)
   \(\rightarrow \rightarrow \rightarrow (x + 2)^2 = 9 \rightarrow (x + 2) = \pm 3 \rightarrow x = -2 \pm 3 \rightarrow x = 1 \text{ or } -5\)
1. \( \sqrt{x} = -1 \)

   \textbf{answer: no solution}

2. \( \sqrt{x + 2} = 3 \)

   \textbf{answer: } x + 2 = 9 \rightarrow x = 7 \rightarrow \text{Check your solution: it works} \rightarrow \text{answer } x = 7

3. \( \sqrt{1 - x} = 1 - x \)

   \textbf{answer: } 1 - x = 1 - 2x + x^2 \rightarrow x^2 - x = 0 \rightarrow x(x - 1) = 0 \rightarrow x = 0 \text{ or } x = 1

   \text{Check your answer: both work} \rightarrow \text{answer: } x = 0 \text{ or } x = 1

4. Write down the quadratic formula.

   \textbf{answer: see your notes}

5. Solve by completing the square.

   \( 2x^2 + 3x + 1 = 0 \)

   \textbf{answer: } x^2 + \frac{3}{2}x = -1/2

   \[ x^2 + \frac{3}{2}x + \left(\frac{3}{4}\right)^2 = -1/2 + \left(\frac{3}{4}\right)^2 \]

   \[ (x + \frac{3}{4})^2 = -8/16 + 9/16 = 1/16 \]

   \[ x + \frac{3}{4} = \pm \frac{1}{4} \rightarrow x = -\frac{3}{4} \pm \frac{1}{4} \rightarrow \text{answer: } x = -2/4 = -1/2 \text{ or } -1 \]

6. Solve by any method

   a) \( x^2 = 4x \)

      \textbf{answer: } x^2 - 4x = 0 \rightarrow x(x - 4) = 0 \rightarrow x = 0 \text{ or } x = 4

   b) \( 3x^2 + 12 = 0 \)

      \textbf{answer: } 3x^2 = -12 \rightarrow x^2 = -4 \rightarrow x = \pm 2i

   c) \( x^4 - 3x^2 - 4 = 0 \)

      \textbf{answer: } (x^2 - 4)(x^2 + 1) = 0 \rightarrow x^2 = 4, \ x = \pm 2 \text{ or } x^2 = -1 \rightarrow x = \pm i
1. Which of these are functions? _________________________
Which are relations? __________________________

   a)                     b)

   c)                     d)

2. What is the domain of

   a)                     b)

   c)

3. What is the range of

   a)                     b)

4. Complete the table and graph

   a) \( y = 2x - 4 \)
1. Find the slope of the line
   a) \( y = -3 \) → \( m = \) _________
   b) \( 2x - y = 3 \) → \( m = \) _________

2. What is the equation of the line that
   a) passes through the points (3, -2) and (-5, -4). → _______________________
   b) has an undefined slope and passes through the point (-3, 1). _____________

3. What is the vertex of the parabola
   a) \( y = -x^2 + 6x + 8 \) → \( V \) ____________
   b) \( y = 4x^2 - 16 \) → \( V \) ____________

4. Sketch the graph of
   a) \( y = 4x^2 - 16 \)
   b) \( f(x) = |x - 2| \)

5. If \( f(x) = x^2 + 2 \) and \( g(x) = -2x \), find \( f + g \) (2). ____________ and \( f \circ g \) (2). __________

6. If \( h(x) = 2^x \), find \( h(1) \). ______

7. What is the domain of \( y = \sqrt{x^2 + 2x} \)
1. Find $x$ if

   a) $x = 2^4 \rightarrow x = _______

   b) $27 = (1/3)^x \rightarrow x = _______

   c) $\log_4 \frac{1}{4} = x \rightarrow x = _______

   d) $\log x = 0.01 \rightarrow x = _______

2. What is the

   a) $x$-intercept of $y = 4^x \rightarrow _______

   b) $y$-intercept of $y = -2^x \rightarrow _______

3. What is the domain of $y = \log_4 x$?

   $y = \log_4 x \rightarrow _______

4. What is the range of $f(x) = 4^x$?

   $f(x) = 4^x \rightarrow _______

5. Find $\log_b x$ if

   $\log_b x^2 = 0.242 \rightarrow x = _______

6. What is the domain of $y = \log (x^2 - 3x)$?

7. Find the solution of the equation $\log (x-2) - \log (x+2) = 0$
1. Find $283 \div 12$. Write in proper form → $283 \div 12 = \square$

2. What is the remainder of $(x^2 + 2) \div (x + 1)$? remainder = \square

What about the remainder of $(2x^3 - 2x + 1) \div (x - 1)$? \square

3. Is $(x - 2)$ a factor of $x^4 - 7x - 2$? Show work! \square

4. If $x + 2$ is a factor of $x^3 + 5x - 2$, then factor $x^3 - 5x - 2$. \square

5. It is known that $x^3 + 8 = 0$ has three roots (solutions) - find them.
1. Construct the next two lines of Pascal’s Triangle

\[
\begin{array}{cccc}
1 & & & \\
1 & 1 & & \\
1 & 2 & 1 & \\
\end{array}
\]

2. Use **synthetic division** to find the **remainder** of \((x^3 + 2x + 1) \div (x + 1)\).

3. Use synthetic division to find the answer to (Proper form is required)

\[
(x^3 + 5x - 1) \div (x - 2) = ________________
\]

4. Use synthetic division and the quadratic formula to find all of the roots of \(x^3 + 2x + 3 = 0\)
(HINT: \(x + 1\) is a factor)

5. How many positive roots does \(x^5 + 4x^3 + 2x^2 + 2 = 0\) have? _________

Why?

6. How many roots does \(x^4 - 16 = 0\) have? _________

What are they?

7. Find all of the rational numbers that should be tested to find the rational roots of \(2x^3 + 4x^2 - x + 5 = 0\)

8. Find the first and second terms of the expansion of \((x + 1/x)^5\) → ________________