PRE-CALCULUS & TRIGONOMETRY SUMMER ASSIGNMENT

Part I: Laws of Exponents

<table>
<thead>
<tr>
<th>Law</th>
<th>Example</th>
<th>Error</th>
<th>Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>$a^m \cdot a^n = a^{m+n}$</td>
<td>$2^2 \cdot 2^3 = (2 \cdot 2)(2 \cdot 2 \cdot 2) = 2^5$</td>
<td>The two numbers multiplied do not have the same base.</td>
</tr>
<tr>
<td>Quotient</td>
<td>$\frac{a^m}{a^n} = a^{m-n}$</td>
<td>$\frac{2^3}{2^2} = \frac{2 \cdot 2 \cdot 2}{2 \cdot 2} = 2^{3-2} = 2^1$</td>
<td>Unless there are ( ) around 2x, the exponent applies only to the a.</td>
</tr>
<tr>
<td>Power</td>
<td>$(a^m)^n = a^{mn}$</td>
<td>$(2^2)^4 = (2 \cdot 2)(2 \cdot 2)(2 \cdot 2) = 2^{8}$</td>
<td>See the product law above. Multiplication of odd exponents</td>
</tr>
<tr>
<td>Inverse</td>
<td>$a^{-1} = \frac{1}{a}$</td>
<td>$2^{-1} = \frac{1}{2}$ (this is a definition)</td>
<td>See the power law above. When raising a power to a power, multiply exponents</td>
</tr>
</tbody>
</table>

The zero exponent rule: $a^0 = 1, \ a \neq 0$

Simplify the expression using the laws of exponents. There should be no negative exponents when completely simplified.

1. $x^5 \cdot x^2$
2. $y^3 \cdot y \cdot y^4$
3. $2b^4 \cdot 3b^{-4}$

4. $\frac{5x^4}{x^9}$
5. $\frac{2e^5}{4e^3}$
6. $\frac{b^3 \cdot b^4}{b^2}$

Distributive Property of Exponents:

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<th>Property</th>
<th>Example</th>
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<tbody>
<tr>
<td>$(xy)^a = x^a y^a$</td>
<td>$(x^2y^3)^2 = (x^2)^2(y^3)^2$</td>
</tr>
<tr>
<td>$(\frac{x}{y})^a = \frac{x^a}{y^a}$</td>
<td>$(\frac{x^2a}{y^{3b}})^3 = (\frac{x^{2a}}{y^{3b}})^3 = (x^{2a} \cdot ^3 (y^{3b}) \cdot ^3 = \frac{x^{2a} \cdot 3}{y^{3b} \cdot 3} = \frac{x^{6a}}{y^{9b}}$</td>
</tr>
</tbody>
</table>

7. $(3x^2)^4$ 8. $(2ab)^5$ 9. $(x^2y^4m^3)^8$

10. $(2x^3y^6)^6$ 11. $p^2 \cdot (p^5)^2$ 12. $(\frac{3x^3}{4y^4})^2$
Putting it all together:

**Part II: Factoring**

Find the GCF for: $30x^2 + 5x^2 - 25x$

**Example of factoring by GCF**

<table>
<thead>
<tr>
<th>Take out the GCF</th>
<th>EX: $15xy^2 - 10x^3y + 25xy^3$</th>
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<tbody>
<tr>
<td>How:</td>
<td>Solution: $5xy(3y - 2x^2 + 5y^2)$</td>
</tr>
<tr>
<td>Check answer by</td>
<td></td>
</tr>
<tr>
<td>distributing out.</td>
<td></td>
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</table>

Factor by GCF:

1. $7ab - 35a^2b$
2. $-3a^2b + 6a^3b^2$
3. $-5x^2 - 5x^3 - 15x^4$
4. $30b^9 + 5ab - 15a^2$
FACTOR BY GROUPING

1. Group the first two terms, and group the second two terms.
2. Factor out the GCF of both pairs.
3. Now the GCF is (x+5)
4. Bring down what is left.
5. Check by multiplying the binomials.

\[
\begin{align*}
2wx + 10w + 7x + 35 \\
\text{factor} + \text{factor}
\end{align*}
\]

\[
= 2w(x + 5) + 7(x + 5)
\]

\[
= (x + 5)(2w + 7) \text{ done!}
\]

Factor by grouping:

1. \(8r^3 - 64r^2 + r - 8\) 
2. \(12p^3 - 21p^2 + 28p - 49\) 
3. \(12x^3 + 2x^2 - 30x - 5\) 
4. \(6v^3 - 16v^2 + 21v - 56\) 
5. \(63n^3 + 54n^2 - 105n - 90\)

Factor the trinomial (using any method)

1. \(b^2 + 8b + 7\) 
2. \(n^2 - 11n + 10\) 
3. \(m^2 + m - 90\) 
4. \(7x^2 - 45x - 28\) 
5. \(2b^2 + 17b + 21\)
Example:

\(9x^2 - 64\)

\(a = 3x\) and \(b = 8\)

\((3x)^2 = 9x^2\) and \(8^2 = 64\)

\((3x + 8)(3x - 8)\)

1. \(r^2 - 4\)

2. \(9x^2 - 1\)

3. \(9v^2 - 121\)

4. \(1 - 36x^2\)

5. \(144 - x^2\)

6. \(m^2 + 100\)
Solve using the Quadratic Formula:

1. \( n^2 + 9n + 11 = 0 \)
2. \( 5p^2 - 125 = 0 \)
3. \( 2x^2 - 5x - 1 = 0 \)
Solve by Factoring:

1. $6n^2 + 5n - 25 = 0$
2. $2x^2 - 11x - 21 = 0$
3. $5v^2 + 3 = -16v$
4. $2n^2 + 13n + 19 = 4$
Solve by completing the square:

1. $a^2 + 8a + 11 = 0$
2. $k^2 + 14k - 19 = 0$
3. $x^2 - 20x + 64 = 0$
Solve any method-

Example: \(5 - 2x^2 = 13\), subtract ‘5’ to both sides and divide by ‘-2’: \(x^2 = -4\), square root (with \(\pm\)) and you get \(x = \pm 2i\)

1) \(-9 - 8x^2 = -209\)

\[\begin{align*}
2) \quad 7r^2 + 8 &= 281 \\
3) \quad 25m^2 - 8 &= -7 \\
4) \quad 2n^2 - 5 &= -35
\end{align*}\]

Rationalize each denominator. When possible, simplify by reducing the resulting fraction.

Ex.. \(\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{\sqrt{4}} = \frac{\sqrt{2}}{2}\)

2. \(\frac{2}{\sqrt{3}}\)

3. \(\frac{1}{\sqrt{7}}\)