Math 3 – Unit 2 Test Review – Polynomial Functions

Directions: Show all work for each problem.

1. Simplify and write in standard form. Then classify by degree and number of terms.
   \((2x - 4x^2 + 12) - (x^2 - 10 + 5)\)
   \(-5x^2 + 2x + 7 \quad \text{quadratic trinomial}\)

2. Simplify and write in standard form. Then classify by degree and number of terms.
   \((w^4 + 2w^2 + 3) + (3w^2 - 5w + 6)\)
   \(w^4 + 5w^3 - 5w + 9 \quad \text{quartic poly of 4 terms}\)

3. Write in standard form. Then classify by degree and number of terms.
   \((4x + 2)(2x^2 - 5x + 8)\)
   \(8x^3 - 16x^2 + 28x + 16 \quad \text{cubic poly of 4 terms}\)

4. Write a polynomial function in standard form with zeros at -1, 2, and 5.
   \(x^3 - 6x^2 + 3x + 10\)

5. Find the remainder when \(f(x) = x^5 - 2x^3 + 3x + 4\) is divided by \(x + 3\).
   \(-194\)

6. Use synthetic division to find the solution to \(\frac{3x^2 + 7}{x - 2}\)
   \(3x + 6 + \frac{19}{x - 2}\)

7. Factor \(x^2 + 7x + 10\)
   \((x + 5)(x + 2)\)
8. Find the zeros of the polynomial function \( f(x) = 3(x + 2)^2(x^2 - 36) \) and state the multiplicity of each.

\[
\begin{align*}
0 & \text{ mult } 1 \\
-2 & \text{ mult } 2 \\
+6 & \text{ mult } 1 \\
-6 & \text{ mult } 1
\end{align*}
\]


\( f(x) = x^3 + 13x^2 + 51x + 63 \)

\[
\begin{align*}
-3 & \text{ mult } 2 \\
-7 & \text{ mult } 1
\end{align*}
\]

10. What would the end behavior be for a function with a degree of 6 and a positive leading coefficient?

\[
\begin{align*}
s(x) & \to \infty \text{ as } x \to -\infty \\
s(x) & \to \infty \text{ as } x \to \infty
\end{align*}
\]

11. Write a polynomial function in standard form whose roots are \((x - 3)(x + 6)(x + 7)\)

\[x^3 + 10x^2 + 3x - 180\]

12. Find the domain and range of the polynomial function graphed below.

\[
D(-\infty, \infty) \\
R(-\infty, 6]
\]

13. Determine the intervals of increase and decrease for the graph in #12.

Increasing \((-\infty, -1) \cup (0, 1)\)

Decreasing \((-1, 0) \cup (1, \infty)\)

14. Identify all the maximum and minimum values for the graph in #12 and classify them as relative or absolute.

Abs. max \((-1, 6)\) and \((1, 6)\)

Rel. min \((-0, 4)\)
15. When a solution has a multiplicity of 2, what does that mean is true about the graph of the function at that solution?

The graph bounces off at \( a \).

16. Factor \( 4x^2 - 36 \)

\[
4x^2 - 36 = (2x + 6)(2x - 6)
\]

17. What are the solutions to the equation \( x^2 + 3x - 10 \)?

\( a, -5 \)

18. What are the solutions to the equation \( 4x^2 + 17x = -11x \)?

\( 0, -7 \)

19. Is \( 5x + 8 \) a factor of the following expression: \( 25x^2 - 64 \)? Explain why or why not.

Yes; plug in the zero \( a \) equals 0

20. Find the zeros of the following expression: \( 8x^2 + 6x = 5 \)

\( x = -\frac{5}{4}, x = \frac{1}{2} \)

21. Is \( x - 7 \) a factor of: \( x^3 - 9x^2 - 9x - 35 \)? Explain why or why not.

No; plug in the zero \( a \) doesn't give 0