$\qquad$ Date:

## Polynomials Test Review

Directions: Be sure to show all work, communicate your thought process, and justify your reasoning. Remember to check that your answers are complete, correct, and reasonable.

1. One factor of $v(x)=2 x^{3}+3 x^{2}-32 x+15$ is $(x+5)$.
a. Determine the $x$-intercepts and $y$-intercept of the graph of $v(x)$.
b. Determine the end behavior of the graph of $v(x)$.
c. Rewrite the end behavior using the following notation:

As x approaches negative infinity, $\mathrm{f}(\mathrm{x})$ approaches $\qquad$ .
*Quicker Version: as $x \rightarrow-\infty, f(x) \rightarrow$ $\qquad$
As x approaches infinity, $\mathrm{f}(\mathrm{x})$ approaches $\qquad$ .
*Quicker Version:
d. Explain how you can determine whether the graph should be above or below the x-axis between each pair of x-intercepts.
2. State the lowest degree, \& write the factored form for the function having the provided zeros.
a. Zeros: $1 / 4$ (M.3), -8 , and 5(M.2)
b. Zeros: -4 and 2/3(M.2)
3. Factor the left side of each equation completely. Then solve. Be sure to state any multiplicities of roots that are not 1.
a. $r^{4}-625=0$.
b. $6 x^{2}+13 x-5=0$
c. $2 x^{4}-15 x^{2}-27=0$
d. $3 x^{3}-8 x^{2}+3 x-8=0$

Factor the left side of each equation completely. Then solve. Be sure to state any multiplicities of roots that are not 1 .
e. $k^{3}+125=0$
f. $4 x^{3}+108=0$
g. $x^{2}(x-9)^{5}-4(x-9)^{5}=0$
4. Indicate whether each function is even, odd, or neither. Support your answer by describing the property of the graph that assists in determining whether the function is even, odd, or neither.
a.

b.

C.

5. Indicate whether each function is even, odd, or neither. Support your answer algebraically.
a. $q(x)=3 x^{3}-9 x^{5}+x$
b. $f(x)=4 x^{10}-8 x^{2}+2 x$
c. $g(x)=3 x^{4}+7 x^{2}$
6. Divide using long division. Write the full resulting quotient.
a. $6 z^{4}+3 z^{3}-z^{2}+2 z-5 \div(2 z-1)$
b. $8 x^{3}+12 x-5 \div(4 x+8 n m)$
7. Write the function that has zeros at $\mathrm{i},-\mathrm{i}$, and $-5(\mathrm{M} .2)$.
8. Divide using synthetic division. Write the full resulting quotient.
a. $9 x^{3}+7 x^{2}-9 x+12 \div(2 x+1)$
b. $-8 d^{5}+4 d^{3}-2 d+8 \div(d-3)$
9. Consider the function $w(x)=2 x^{3}-9 x^{2}-33 x-14$.
a. State all possible rational roots of the function.
b. Prove or disprove whether -2 is a root of the function.
c. Determine all roots of the function.
10. Write the function that has zeros at $1 / 3$ and 7 (M.2)
11. Write the function that has zeros at $\pm 2 i$.
12. Consider the function $t(x)=(4 x-3)(-x-2)(x-8)$.
a. What is the $y$-intercept?
b. Determine the x-intercepts.
c. State the intervals for which $\mathrm{t}(\mathrm{x})>0$ and those for which $\mathrm{t}(\mathrm{x})<0$.
d. Which most accurately describes the end behavior of the graph of $t(x)$ ?
a. as $x \rightarrow-\infty, f(x) \rightarrow-\infty$ and as $x \rightarrow \infty, f(x) \rightarrow \infty$
b. as $x \rightarrow-\infty, f(x) \rightarrow \infty$ and as $x \rightarrow \infty, f(x) \rightarrow \infty$
c. as $x \rightarrow-\infty, f(x) \rightarrow-\infty$ and as $x \rightarrow \infty, f(x) \rightarrow-\infty$
d. b. as $x \rightarrow-\infty, f(x) \rightarrow \infty$ and as $x \rightarrow \infty, f(x) \rightarrow-\infty$
13. Perform each operation.
a. $\left(7 h^{3} k^{2}+6 h^{2}-k^{2}+9\right)+\left(9 k^{3}+h^{2} k^{3}-k^{2}-20\right)$
b. $\left(8 b^{2} c-11 b^{2}+9 b-c^{2}+2\right)-\left(3 b^{2}+b^{2} c-8 b+5\right)$
$\qquad$
$\qquad$
c. $\left(3 w^{3}-8 w+5\right)(2 w-1)$
d. $\left(4 r^{3} s+5 s^{3}\right)(2 r-8)$
e. $\left(12 p^{2} q^{2}-8 p^{2}+10 q^{2}+9 p\right)-\left(22 p^{2} q^{2}+3 q^{2}-2 p^{2}+1\right)$

## ^ Develop Your Efficiency!

 A Few Time Savers...Consider a function in factored form, such as $j(x)=(8 x-9)(2 x+5)(x-3)(-x+9)(x-1)$
A. Without multiplying all factors together, how could you determine the $y$-intercept?
B. Without multiplying all factors together, how could you determine the end behavior?
C. How can you most efficiently and quickly determine the $x$-intercepts and whether $j(x)>0$ or $j(x)<0$ between each pair of intercepts?

