Unit 4 Polynomials
Review

Name: _____ Key

1. Perform the operation: $(-6x+7)(8x^2+8x+1)$

$-48x^3 - 48x^2 - 6x + 56x^2 + 56x + 7$

$$\boxed{-48x^3 + 8x^2 + 50x + 7}$$

2. Factor: $64s^3 + 27$

$(4s+3)(16s^2 - 12s + 9)$

3. Factor: $(x^3 - 2x^2 - x + 2)$

$x^2(x-2) - 1(x-2)$
$(x-2)(x^2-1)$
$(x-2)(x-1)(x+1)$

4. Divide: $(x^4 - 3x^2 + 5) \div (x^2 + 2x - 3)$

$$\boxed{x^2 - 2x + 4 + \frac{-14x+17}{x^2+2x-3}}$$

$$x^2+2x-3 \overline{) x^4 + 0x^3 - 3x^2 + 0x + 5}$$
$\underline{x^4 + 2x^3 - 3x^2}$
$-2x^3 + 0x^2 + 0x$
$\underline{-2x3 - 4x^2 + 6x}$
$4x2 - 6x + 5$
$\underline{4x2 + 8x - 12}$
$-14x + 17$

5. Use synthetic division to divide: $(4x^3 + 18x^2 + 20x + 6) \div (x+3)$

$$\begin{array}{r|rrrr} -3 & 4 & 18 & 20 & 6 \\ & & -12 & -18 & -6 \\ \hline & 4 & 6 & 2 & \boxed{0} \end{array}$$

$$\boxed{4x^2 + 6x + 2}$$

6. If $f(x) = x^3 - 11x^2 + 18x + 35$, find f(4)

$$\begin{array}{r|rrrr} 4 & 1 & -11 & 18 & 35 \\ & & 4 & -28 & -40 \\ \hline & & -7 & -10 & -5 \end{array}$$

$f(4) = -5$

7. If (x + 3) is a root, find all solutions to $f(x) = x^3 + 9x^2 + 26x + 24$

$$-3 \;\vert\; \begin{array}{cccc} 1 & 9 & 26 & 24 \\ & -3 & -18 & -24 \end{array}$$
$$\begin{array}{cccc} 1 & 6 & 8 & \boxed{0} \end{array}$$

$x^2 + 6x + 8$

$(x+4)(x+2)$

$$\boxed{x = -3, -4, -2}$$

8. List all possible rational zeros of $f(x) = -2x^4 - 9x^3 - 3x^2 - 7x + 6$

$p = \pm 1, 2, 3, 6$

$q = \pm 1, 2$

poss. rational zeros : $\pm 1, 2, 3, 6, \frac{1}{2}, \frac{3}{2}$

9. Find all zeros of $f(x) = x^4 - 8x^3 + 56x - 49$

$p = \pm 1, 7, 49$

$q = \pm 1$

$$1 \;\vert\; \begin{array}{ccccc} 1 & -8 & 0 & 56 & -49 \\ & 1 & -7 & -7 & 49 \end{array}$$
$$\begin{array}{ccccc} 1 & -7 & -7 & 49 & \boxed{0} \end{array}$$

$x = 1, 7, \pm \sqrt{7}$

$(x^3 - 7x^2)(-7x + 49)$

$x^2(x-7) - 7(x-7)$

$(x-7)(x^2-7)$

10. Given -2i is a root, determine all other roots of $f(x) = x^3 + 4x^2 + 4x + 16$

$(x - 2i)(x + 2i)$

$x^2 + 4$

$$\boxed{x = \pm 2i, -4}$$

$$\begin{array}{r} x + 4 \\ x^2 + 0x + 4 \;\overline{\big)\; x^3 + 4x^2 + 4x + 16} \\ \underline{x^3 + 0x^2 + 4x} \\ 4x^2 + 0x + 16 \\ \underline{4x^2 + 0x + 16} \\ 0 \end{array}$$

11. Write $f(x) = x^3 - 3x^2 + 36x - 108$ as a product of linear factors.
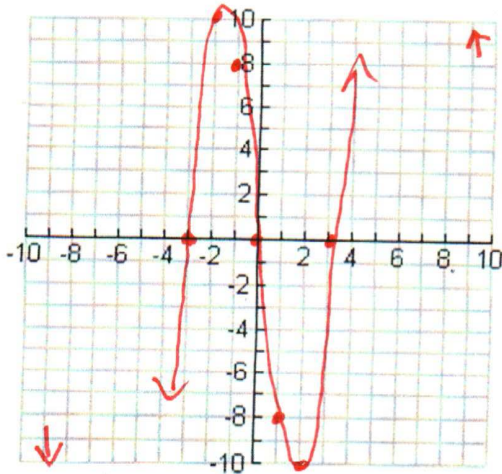
$$x^2(x-3) + 36(x-3)$$

$$(x-3)(x^2+36)$$

$$(x-3)(x+6i)(x-6i)$$

12. Use Descartes' Rule of Signs to determine the possible number of positive and negative zeros of $f(x) = 2x^3 - 3x^2 + 4x - 1$

positive: 3 or 1

neg : 0

13. Graph $f(x) = x^3 - 9x$, be sure to include end behavior, multiplicity and intercepts.
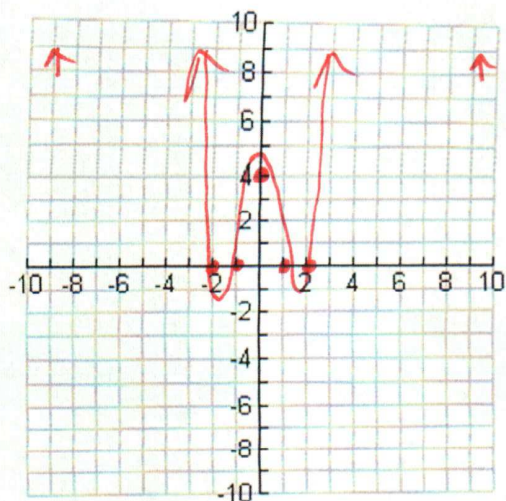

$$x^e(x^2-9)$$

$$x(x-3)(x+3)$$

-1	8
-2	10
1	-8
2	-10

14. Graph $f(x) = x^4 - 5x^2 + 4$, be sure to include end behavior, multiplicity and intercepts.

$(x^2-4)(x^2-1)$

$(x-2)(x+2)(x-1)(x+1)$

1.5

15. Find a 3rd degree polynomial function with integer coefficients which has the given zeros: -1 and 4i

$(x+1)(x-4i)(x+4i)$

$(x+1)(x^2+16)$

$x^3 + x^2 + 16x + 16$