Accelerated Geom/Alg 2
Polynomials #2 Test Review

Name_____

Find all of the zeroes for the following polynomials. Leave all answers in simplest radical form. Show the process for finding the zeros (synthetic division).

1. $f(x) = x^4 - x^3 - 22x^2 + 16x + 96$

$$\begin{array}{r|rrrr} -4 & 1 & -1 & -22 & 16 & 96 \\ & & -4 & 20 & 8 & -96 \\ \hline -2 & 1 & -5 & -2 & 24 & 0 \\ & & -2 & 14 & -24 & \\ \hline & 1 & -7 & 12 & 0 & \end{array}$$

$x^2 - 7x + 12 = 0$

$(x-3)(x-4) = 0$

zeros: $x = 3, 4, -2, -4$

Factored Form:
$f(x) = (x-3)(x-4)(x+2)(x+4)$

2. $g(x) = 2x^4 + x^3 + 5x^2 + 4x - 12$

$$\begin{array}{r|rrrr} 1 & 2 & 1 & 5 & 4 & -12 \\ & & 2 & 3 & 8 & 12 \\ \hline -1.5 & 2 & 3 & 8 & 12 & 0 \\ & & -3 & 0 & -12 & \\ \hline & 2 & 0 & 8 & 0 & \end{array}$$

$2x^2 + 8 = 0$

$2x^2 = -8$

$x^2 = -4$

$x = \pm 2i$

zeros: $x = 1, -1.5, \pm 2i$

Factored Form:
$f(x) = (x-1)(2)(x^2+4)(2x+3)$

3. $y = 3x^3 + 19x^2 + 19x - 5$

$$\begin{array}{r|rrrr} -5 & 3 & 19 & 19 & -5 \\ & & -15 & -20 & 5 \\ \hline & 3 & 4 & -1 & 0 \end{array}$$

$3x^2 + 4x - 1 = 0$

$\frac{-4 \pm \sqrt{16+12}}{6} = \frac{-4 \pm \sqrt{28}}{6}$

$\sqrt{28}$: $14 \cdot 2$, $7 \cdot 2$

$= \frac{-4 \pm 2\sqrt{7}}{6} = \frac{-2 \pm \sqrt{7}}{3}$

zeros: $x = -5, \frac{-2 \pm \sqrt{7}}{3}$

Factored Form:
$f(x) = (x+5)(3x^2+4x-1)$

4. $y = x^4 - x^2 - 600$

5 | 1 0 -1 0 -600
  | 5 25 120 600
-5 | 1 5 24 120 | 0
  | -5 0 -120
  | 1 0 24 | 0 $\longrightarrow x^2 + 24 = 0$

$x^2 = -24$

$x = \pm 2i\sqrt{6}$

$\sqrt{24}$: $24 = 12 \cdot 2$, $12 = 6 \cdot 2$, $6 = 3 \cdot 2$

Zeros: $x = 5, -5, \pm 2i\sqrt{6}$

Factored Form: $(x+5)(x-5)(x^2+24)$

5. $4x^5 - 68x^4 - 20x^3 + 612x^2 - 144x = 0$

-3 | 4 -68 -20 612 -144 0
  | -12 240 -660 144 0
0 | 4 -80 220 -48 0 | 0
  | 0 0 0 0
3 | 4 -80 220 -48 | 0
  | 12 -204 48
  | 4 -68 16 | 0 $\longrightarrow 4x^2 - 68x + 16 = 0$

$4(x^2 - 17x + 4) = 0$

$x^2 - 17x + 4 = 0$

$\frac{17 \pm \sqrt{289 - 16}}{2} = \frac{17 \pm \sqrt{273}}{2}$

$\sqrt{273}$: $273 = 3 \cdot 91$, $91 = 7 \cdot 13$

Zeros: $x = -3, 0, 3, \frac{17 \pm \sqrt{273}}{2}$

Factored Form:
$f(x) = (x-3)(x+3)(x)(4x^2 - 68x + 16)$

6. List all **possible** rational roots for $h(x) = 5x^3 + 3x^2 - 17x + 45$

p: $\pm 1, \pm 3, \pm 5, \pm 9, \pm 15, \pm 45$

q: $\pm 1, \pm 5$

all possible $\rightarrow$ p/q: $\pm 1, \pm 3, \pm 5, \pm 9, \pm 15, \pm 45, \pm \frac{3}{5}, \pm \frac{9}{5}$

7. Write the function whose roots are: 6, 10, -5, and -8

$f(x) = (x-6)(x-10)(x+5)(x+8)$

8. Write the function whose zeroes are: 5i, 3, -7i

$f(x) = (x+5i)(x-5i)(x-3)(x-7i)(x+7i)$

9. Identify the following for each of the polynomials given.

$f(x) = -4x^4 - 5x^2 + x + 7$

Degree of polynomial: 4

Name by the degree of the polynomial: Quartic

# of terms: 4

Name of the polynomial by the number of terms: Polynomial

Leading coefficient: -4

Symmetry: none

End behavior: as $x \to -\infty$, $f(x) \to -\infty$

as $x \to \infty$, $f(x) \to -\infty$

10. $f(x) = -2x(x-6)^2(x+7)(x-1)$

Degree of the polynomial: 5

Name by the degree of the polynomial: Quintic

Leading coefficient: -2

Symmetry: none

List the zeroes of the polynomials: x = -7, 0, 1, 6

End behavior: as $x \to -\infty$, $f(x) \to \infty$

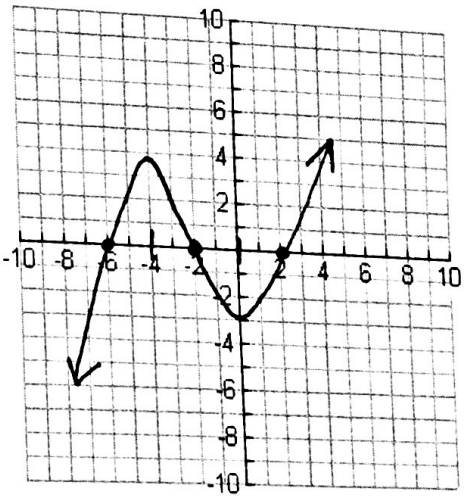
as $x \to \infty$, $f(x) \to -\infty$

11. Sketch the graph of the polynomial function with the following characteristics:

Zeroes: -6, -2, 2,

Intervals of increase: $[-\infty, -4], [0, \infty]$

Intervals of decrease: $[-4, 0]$



Determine the type of symmetry based off of the graph.

none

12. Write the equation of the function that opens down and whose roots are -3, -1, 2, and 6.

$f(x) = -(x+3)(x+1)(x-2)(x-6)$

13. Based off of the equation $h(x) = 2x^4 - 12x^3 - 70x^2 + 264x + 160$, name the polynomial from its degree, identify the zeroes, end behavior, determine the type of symmetry, the intervals of increase and decrease, and the local and absolute maximums and minimums (if there are any, if not, write none).

Name of Polynomial: Quartic

Zeroes: $x = -5.16, -.537, 3.537, 8.16$

Type of Symmetry: none

Relative Maximum(s): $(1.5, 368.125)$

Relative Minimum(s): $(-3.424, -808) \cap (6.424, -808)$

Absolute Max/Min: $(-3.424, -808) \cap (6.424, -808)$

Intervals of increase: $(-3.424, 1.5) \cap (6.424, \infty)$

Intervals of decrease: $(-\infty, -3.424) \cap (1.5, 6.424)$

End behavior: as $x \to -\infty$, $f(x) \to \infty$
as $x \to \infty$, $f(x) \to \infty$

Apply the identities to the following polynomials.

14. $36x^2 - 25y^2$ $(6x+5y)(6x-5y)$

15. $(3x+7)^3$ $27x^3 + 189x^2 + 441x + 343$

16. $(4-5y)^2$ $16 - 40y + 25y^2$

17. $1331x^3 - 343y^3$ $(11x-7y)(121x^2 + 77xy + 49y^2)$

18. $256x^4 + 225y^2$ $(16x^2 + 15iy)(16x^2 - 15iy)$

19. $(2x+5)^2$ $4x^2 + 20x + 25$

20. $27x^3 + 8y^6$ $(3x+2y^2)(9x^2 - 6xy^2 + 4y^4)$

21. $(x-2y)^3$ $x^3 - 6x^2y + 12xy^2 - 8y^3$