

Unit 4A

Name _____ Date _____ Period Key

Unit 4A Test Review

1. Write an equation in **factored form** for the function with the given zeros: $x = 5, -4, 1$

$$f(x) = (x-5)(x+4)(x-1)$$

2. Write an equation in **standard form** for the function with the given zeros: $x = -3, 4$

$$f(x) = (x+3)(x-4)$$

$$f(x) = x^2 - 4x + 3x - 12$$

$$f(x) = x^2 - x - 12$$

For the given polynomials, determine which of the binomials listed are factors using the Remainder Theorem. Show work!

3. $f(x) = x^2 + 3x - 10$

~~a.~~ $x+2$ $x=-2$

b. $x-2$ $x=2$

c. $x+5$ $x=-5$

$$f(-2) = (-2)^2 + 3(-2) - 10$$

$$= 4 - 6 - 10 = -12$$

$$f(2) = 2^2 + 3(2) - 10 = 0$$

$$f(-5) = (-5)^2 + 3(-5) - 10 = 0$$

4. $f(x) = x^3 - 2x^2 - 5x + 6$

a. $x+2$ $x=-2$

b. $x-1$ $x=1$

~~c.~~ $x+9$ $x=-9$

$$f(-2) = (-2)^3 - 2(-2)^2 - 5(-2) + 6$$

$$= -8 - 8 + 10 + 6 = 0$$

$$f(1) = 1^3 - 2(1)^2 - 5(1) + 6 = 0$$

$$f(-9) = (-9)^3 - 2(-9)^2 - 5(-9) + 6$$

$$= -729 - 162 + 45 + 6 = -840$$

Find how many zeros each polynomial has and list the end behavior for the following:

5. $f(x) = x^8 + 16x$ **Positive even**

a. Number of Zeros: **8**

↑ b. Left End Behavior: $\lim_{x \rightarrow -\infty} f(x) = \infty$

↑ c. Right End Behavior: $\lim_{x \rightarrow \infty} f(x) = \infty$

6. $f(x) = x^5 - x^2 + 8x - 13$ **Positive odd**

a. Number of Zeros: **5**

↓ b. Left End Behavior: $\lim_{x \rightarrow -\infty} f(x) = -\infty$

↑ c. Right End Behavior: $\lim_{x \rightarrow \infty} f(x) = \infty$

7. $f(x) = -x^3 - 45$ **Negative odd**

a. Number of Zeros: **3**

↑ b. Left End Behavior: $\lim_{x \rightarrow -\infty} f(x) = \infty$

↓ c. Right End Behavior: $\lim_{x \rightarrow \infty} f(x) = -\infty$

8. $f(x) = -x^6 - 13x + 7$ **Negative even**

a. Number of Zeros: **6**

↓ b. Left End Behavior: $\lim_{x \rightarrow -\infty} f(x) = -\infty$

↓ c. Right End Behavior: $\lim_{x \rightarrow \infty} f(x) = -\infty$

Find the zeros of the function by factoring or using the quadratic formula.

9. $f(x) = x^2 - 49$ PIF OF SQUARES

$$0 = x^2 - 49$$

$$0 = (x+7)(x-7)$$

$$\boxed{x = -7 \quad x = 7}$$

10. $f(x) = 5x^2 + 8x - 4$

Grouping

$$0 = 5x^2 + 8x - 4$$

$$\begin{array}{r} x \quad + \\ -20 \quad | \quad 8 \\ \hline 10 \quad -2 \end{array}$$

$$0 = 5x^2 + 10x - 2x - 4$$

$$0 = 5x(x+2) - 2(x+2)$$

$$0 = (5x-2)(x+2)$$

$$\boxed{x = 2/5 \quad x = -2}$$

11. $f(x) = x^2 + 13x + 36$ Short Cut

$$0 = x^2 + 13x + 36$$

$$0 = (x+9)(x+4)$$

$$\boxed{x = -9 \quad x = -4}$$

12. $f(x) = x^2 - 4x - 8$

$$0 = x^2 - 4x - 8$$

$$a=1 \quad b=-4 \quad c=-8$$

$$x = 4 \pm \sqrt{16 + 32}$$

$$x = \frac{4 \pm \sqrt{48}}{2}$$

$$x = \frac{4 \pm 4\sqrt{3}}{2}$$

$$\boxed{x = 2 \pm 2\sqrt{3}}$$

13. $f(x) = x^2 + 8x + 17$

cont factor

$$a=1 \quad b=8 \quad c=17$$

Quadratic Formula

$$x = \frac{-8 \pm \sqrt{64 - 4(1)(17)}}{2(1)}$$

$$\frac{-8 \pm \sqrt{-4}}{2}$$

$$\frac{-8 \pm 2i}{2} = \boxed{-4 \pm i}$$

14. $f(x) = x^2 + 16$

$$a=1 \quad b=0 \quad c=16$$

$$x = \frac{0 \pm \sqrt{0^2 - 4(1)(16)}}{2(1)}$$

$$\frac{\pm \sqrt{-64}}{2}$$

$$\frac{\pm 8i}{2}$$

$$\boxed{x \pm 4i}$$

15. $f(x) = x^2 - 10x + 34$

$$a=1 \quad b=-10 \quad c=34$$

$$x = \frac{10 \pm \sqrt{100 - 4(1)(34)}}{2(1)}$$

$$x = \frac{10 \pm \sqrt{-36}}{2}$$

$$x = \frac{10 \pm 6i}{2}$$

$$\boxed{x = 5 \pm 3i}$$

List the zeros of each polynomial. State the multiplicity of each zero and determine whether the graph crosses or touches the x-axis at the corresponding x-intercept.

16. $f(x) = x^4(x-1)(x+8)$

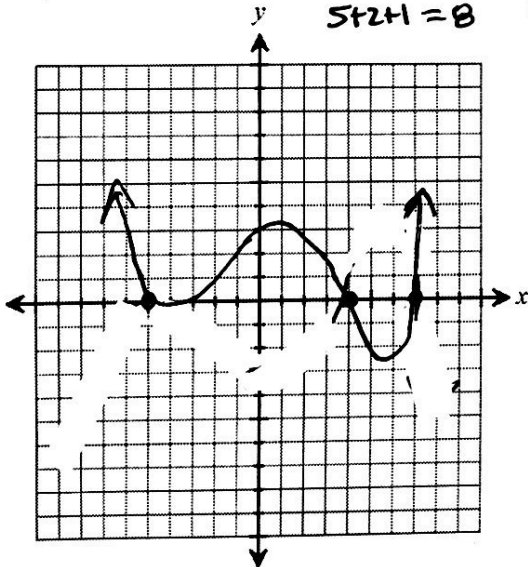
17. $f(x) = (x-2)^3(x+6)^3(x-10)$

Zero	Multiplicity	Touch/Cross
0	4 even	touch
1	1 odd	CROSS
-8	1 odd	CROSS

Zero	Multiplicity	Touch/Cross
2	3 odd	CROSS
-6	3 odd	CROSS
10	1 odd	CROSS

Without using a graphing calculator, sketch the graph each function below. Identify the zeros, multiplicity, and whether the graph touches or crosses the x-axis. Determine the end behavior.

18. $f(x) = (x-4)^5(x+5)^2(x-7)$ positive even
 $5+2+1=8$

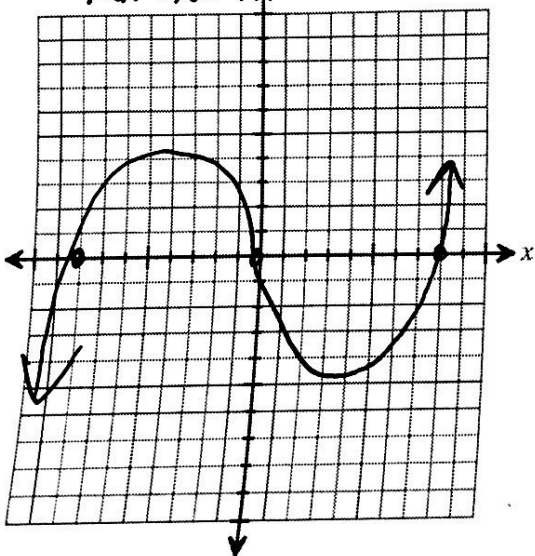


Zero	Multiplicity	Touch/Cross
4	5 odd	CROSS
-5	2 even	touch
7	1 odd	CROSS

$\uparrow \lim_{x \rightarrow -\infty} f(x) = -\infty$

$\uparrow \lim_{x \rightarrow \infty} f(x) = \infty$

19. $f(x) = x^3 - 64x$ Positive odd
 $x(x^2 - 64)$
 $x(x-8)(x+8)$

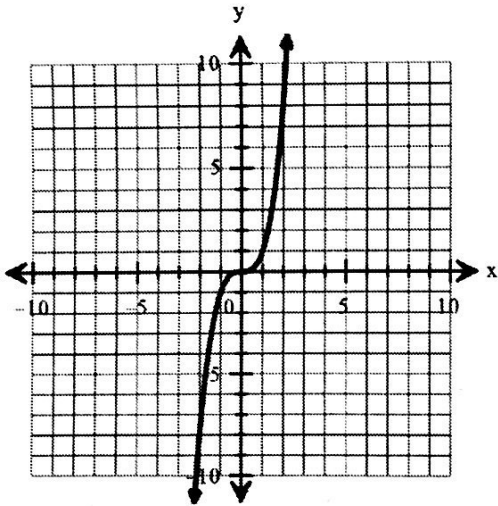


Zero	Multiplicity	Touch/Cross
0	1 odd	CROSS
8	1 odd	CROSS
-8	1 odd	CROSS

$\downarrow \lim_{x \rightarrow -\infty} f(x) = -\infty$

$\uparrow \lim_{x \rightarrow \infty} f(x) = \infty$

20. $g(x) = x^3$



Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

x-intercept(s): $(0,0)$

y-intercept: $(0,0)$

Increasing: $(-\infty, \infty)$

Decreasing: NA

Constant: NA

Positive: $(0, \infty)$

Negative: $(-\infty, 0)$

Maximums/Minimums: none

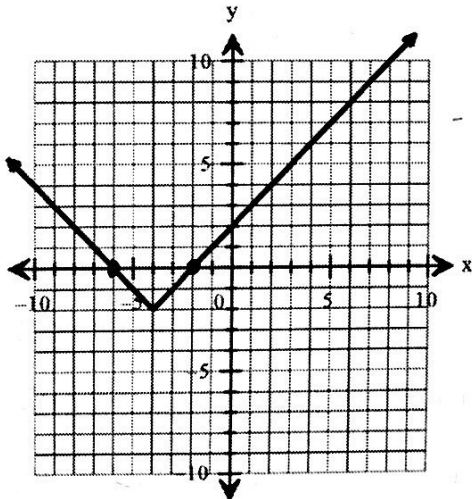
Symmetry: ODD

End Behavior:

$\lim_{x \rightarrow -\infty} f(x) = -\infty$

$\lim_{x \rightarrow +\infty} f(x) = \infty$

21. $h(x) = |x+4| - 2$



Domain: $(-\infty, \infty)$

Range: $[-2, \infty)$

x-intercept(s): $(-2,0)$
 $(-6,0)$

y-intercept: $(0,2)$

Increasing: $(-4, \infty)$

Decreasing: $(-\infty, -4)$

Constant: NA

Positive: $(-\infty, -6) \cup (-2, \infty)$

Negative: $(-6, 2)$

Maximums/Minimums: $(-4, -2)$

Symmetry: none

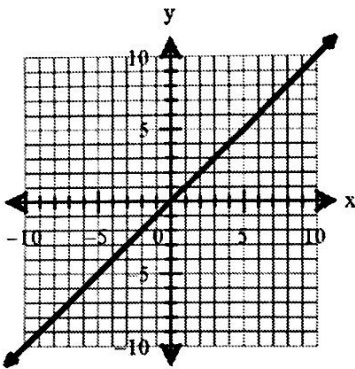
End Behavior:

$\lim_{x \rightarrow -\infty} f(x) = \infty$

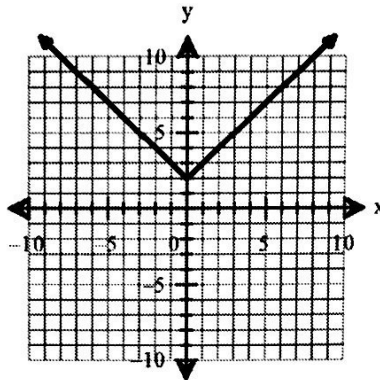
$\lim_{x \rightarrow +\infty} f(x) = \infty$

Use the six graphs below to answer questions 6-13 Each problem may have more than one answer.

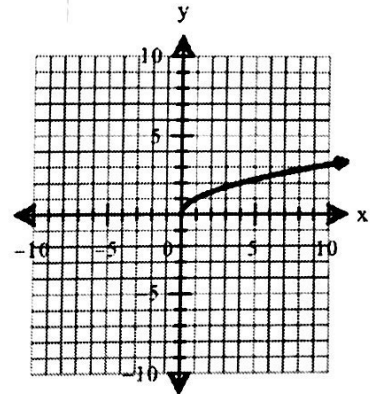
A. $f(x) = x$



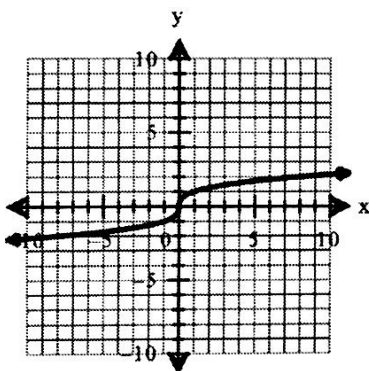
B. $f(x) = |x| + 2$



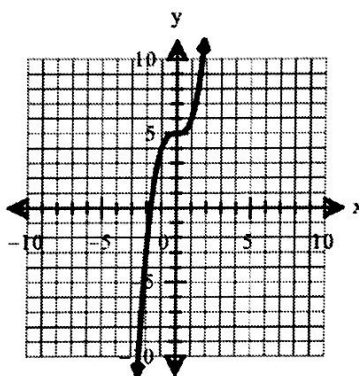
C. $f(x) = \sqrt{x}$



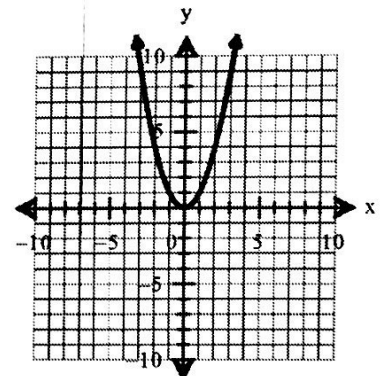
D. $f(x) = \sqrt[3]{x}$



E. $f(x) = x^3 + 5$



F. $f(x) = x^2$



22. Which graph(s) have no zeros? **B**

23. Which graph(s) have a domain of $(-\infty, \infty)$? **A, B, D, E, F**

24. Which graph(s) have a range of $[0, \infty)$? **C, F**
bottom to top

25. Which graph(s) are increasing on part of their domain and decreasing on part of their domain?

26. Which graph(s) have a y-intercept of $(0, 0)$? **B, F**

A, C, D, F

27. Which graph(s) have even symmetry? **B, F**

B, F

28. Which graph(s) have odd symmetry? **A, D**

A, D

29. Which graph(s) have neither even nor odd symmetry? **C, E**

C, E