Name: Date: Class: Team:

Math 3 Unit 4 Polynomial Functions Review Part II

Directions: Read each problem carefully. Show all work and box/circle your final answer.

Use TIPS: Highlight/underline important information/text, Work out the problem, Write the final answer using a complete sentence.	Answer

1. Complete WB p. 42-43 #1, 2, 5, 9, 10, 11 Include the type of function and describe the end behavior in words(starts__ and ends __) and using the correct notation.

2. Complete WB p. 49 #4-5 Fill in the missing key features. Label the graph with the key features.

3. You are given one factor. Use that factor to find the remaining factors, the roots of the function, and write the function in factored form. There are videos on the class website for review.
Function: $f(x) = 3x^3 - 11x^2 + 13x - 6 = 0$ Factor: (x-2) Roots of function:

x^3 x^2 x c

$$\begin{array}{r|rrrr} 2 & 3 & -11 & 13 & -6 \\ & \downarrow & +6 & +-10 & +6 \\ \hline & 3 & -5 & 3 & 0 \end{array}$$

x^2 x c R

$x-2=0$
$x=2$

$f(x)=(x-2)(3x^2-5x+3)$ $a=3$ $b=-5$ $c=3$

$\boxed{x=2}$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x=\frac{5\pm\sqrt{(-5)^2-4(3)(3)}}{2(3)}$

$x=\frac{5\pm\sqrt{25-36}}{6}$

$x=\frac{5\pm\sqrt{-11}}{6}$

$\sqrt{-11}$, $\sqrt{-1}\cdot\sqrt{11}$, $i\cdot\sqrt{11}$

$\boxed{x=\frac{5\pm i\sqrt{11}}{6}}$

Quotient: $\boxed{3x^2-5x+3}$

Factored form: $\boxed{f(x)=(x-2)(3x^2-5x+3)}$

$\boxed{\{2, \frac{5\pm i\sqrt{11}}{6}\}}$

3. You are given one factor. Use that factor to find the remaining factors, the roots of the function, and write the function in factored form. There are videos on the class website for review.
Function: $f(x) = x^4 - 2x^2 - 8 = 0$ Factor: (x-2) ← div. Roots of function:

x^4 x^3 x^2 x c

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & -2 & 0 & -8 \\ & \downarrow & +2 & +4 & +4 & +8 \\ \hline & 1 & 2 & 2 & 4 & 0 \end{array}$$

x^3 x^2 x c R

$x=2$

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

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

$\boxed{x=2}$ $\boxed{x=-2}$ $x^2=-2$

$\sqrt{x^2}=\sqrt{-2}$

$\boxed{x=\pm i\sqrt{2}}$ ← conjugate pairs

$\sqrt{-2}$, $\sqrt{-1}\cdot\sqrt{2}$, $i\cdot\sqrt{2}$

Quotient: $\boxed{x^3+2x^2+2x+4}$

Factored form: f(x)= (divisor)(quotient)

$\boxed{f(x)=(x-2)(x^3+2x^2+2x+4)}$

4 roots

$\boxed{\{-2, 2, \pm i\sqrt{2}\}}$

5. Use the class website to review videos and/or complete practice activities for previous units.

$=(x-2)$ $\boxed{x^3+2x^2}$ $\boxed{2x+4}$ ← factor by grouping

$\boxed{x^2(x+2)}$ $\boxed{2(x+2)}$

$\boxed{f(x)=(x-2)(x+2)(x^2+2)}$

Quadratic Formula extra practice: WB p. 32 #1-6

~~$a(x)=x^2+3x-10$~~

① $x^2+20x+51$
$x=-3$ and -17

② $x^2+10x+25$
$x=-5$ m. 2

③ $3x^2+12x$
$x=0$ & -4

④ x^2-11
$x=\pm\sqrt{11}$

⑤ x^2+x-1
$x=\frac{-1\pm\sqrt{5}}{2}$

⑥ x^2+2x+3
$x=-1\pm\sqrt{2}i$

Part II: Using end behavior patterns

Key

For each situation:

- Determine the function type. If it is a polynomial, state the degree of the polynomial and whether it is an even degree polynomial or an odd degree polynomial.
- Describe the end behavior based on your knowledge of the function. Use the format: As $x \to -\infty, f(x) \to$ _____ *and* as $x \to \infty\ f(x) \to$ _____

1. $f(x) = 3 + 2x$ $2x+3$ + L.C. Odd degree

   Function type: linear binomial

   End behavior: As $x \to -\infty, f(x) \to$ $-\infty$ starts ↓

   End behavior: As $x \to \infty, f(x) \to$ ∞ ends ↑

2. $f(x) = x^4 - 16$ + L.C. Even degree

   Function type: quartic binomial

   End behavior: As $x \to -\infty, f(x) \to$ ∞ starts ↑

   End behavior: As $x \to \infty, f(x) \to$ ∞ ends ↑

3. $f(x) = 3^x$

   Function type: exponential asymptote $x=0$

   End behavior: As $x \to -\infty, f(x) \to$ 0

   End behavior: As $x \to \infty, f(x) \to$ ∞

4. $f(x) = x^3 + 2x^2 - x + 5$ + L.C. odd degree

   Function type: Cubic 4-term polynomial

   End behavior: As $x \to -\infty, f(x) \to$ $-\infty$ starts down

   End behavior: As $x \to \infty, f(x) \to$ ∞ ends up

5. $f(x) = -2x^3 + 2x^2 - x + 5$ − L.C. odd degree

   Function type: cubic 4 term polynomial

   End behavior: As $x \to -\infty, f(x) \to$ ∞ starts ↑

   End behavior: As $x \to \infty, f(x) \to$ $-\infty$ ends ↓

6. $f(x) = log_2 x$

   Function type: log

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

   End behavior: As $x \to \infty, f(x) \to$ 0 asymptote $y=0$

7. $f(x) = -2(x-3)(x+4)$ − L.C. even degree

   Function type: quadratic trinomial

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

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

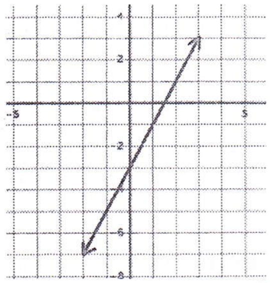
   $-2(x^2 - 3x + 4x - 12)$

   $-2(x^2 + x - 12)$

   $f(x) = -2x^2 - 2x + 24$

Use the graphs below to describe the end behavior of each function. Use the same format as above.

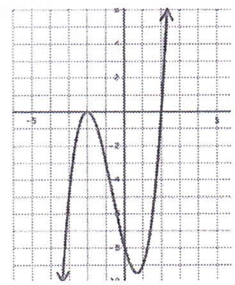
8.



End behavior: As $x \rightarrow -\infty, f(x) \rightarrow$ ____

End behavior: As $x \rightarrow \infty, f(x) \rightarrow$ ____

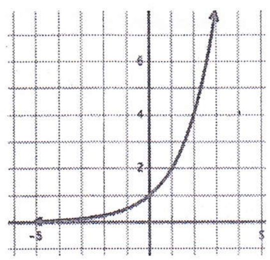
9.



End behavior: As $x \rightarrow -\infty, f(x) \rightarrow$ $-\infty$ starts ↓

End behavior: As $x \rightarrow \infty, f(x) \rightarrow$ ∞ ↑ ends

10.

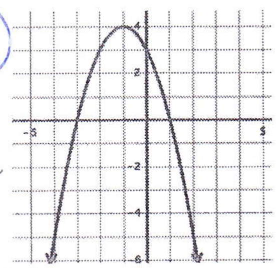


approaches asymptote $x = 0$

End behavior: As $x \rightarrow -\infty, f(x) \rightarrow$ 0

End behavior: As $x \rightarrow \infty, f(x) \rightarrow$ ∞ ↑ ends up

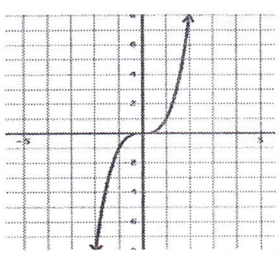
11.



End behavior: As $x \rightarrow -\infty, f(x) \rightarrow$ $-\infty$ starts ↓

End behavior: As $x \rightarrow \infty, f(x) \rightarrow$ $-\infty$ ends ↓

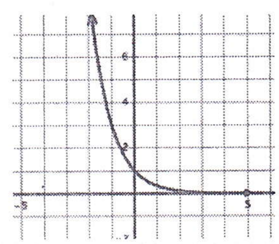
12.



End behavior: As $x \rightarrow -\infty, f(x) \rightarrow$ ____

End behavior: As $x \rightarrow \infty, f(x) \rightarrow$ ____

13.



End behavior: As $x \rightarrow -\infty, f(x) \rightarrow$ ____

End behavior: As $x \rightarrow \infty, f(x) \rightarrow$ ____

14. How does the end behavior for quadratic functions connect with the number and type of roots for these functions? How does the end behavior for cubic functions connect with the number and type of roots for cubic functions?

4.

Function:

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

End behavior:

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

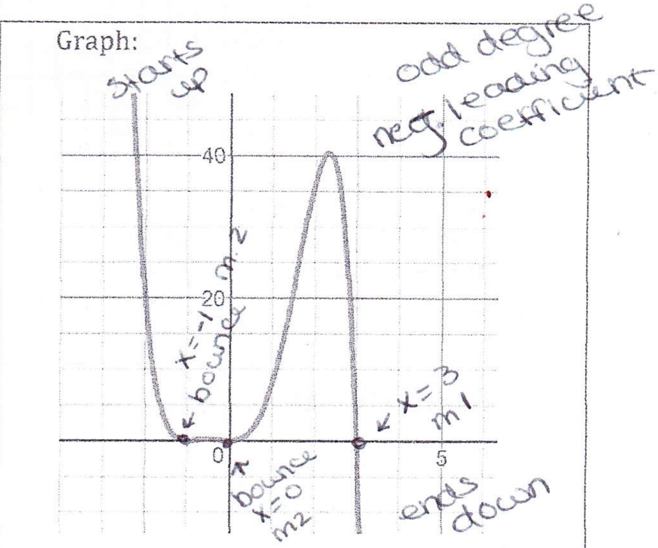
Roots (with multiplicity):
(3,0) m: 1;
(-1,0) m: 2
(0,0) m: 2

Value of leading co-efficient: -1

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

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

Graph:



Factored form: $-x^2(x+1)^2(x-3)$

$f(x) = -1 \cdot x^2(x+1)^2(x-3)$
$= -1 \cdot x^2(x+1)(x+1)(x-3)$
$= -1 \cdot x^2(x^2+2x+1)(x-3)$
$= -1 \cdot x^2(x^3+2x^2+x-3x^2-6x-3)$
$= -1 \cdot x^2(x^3-x^2-5x-3)$
$= -x^2(x^3-x^2-5x-3)$
$= -x^5+x^4+5x^3+3x^2$

5.

Function:

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

End behavior:

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

Roots (with multiplicity):
2 (mult. 2), -2 (mult. 2)

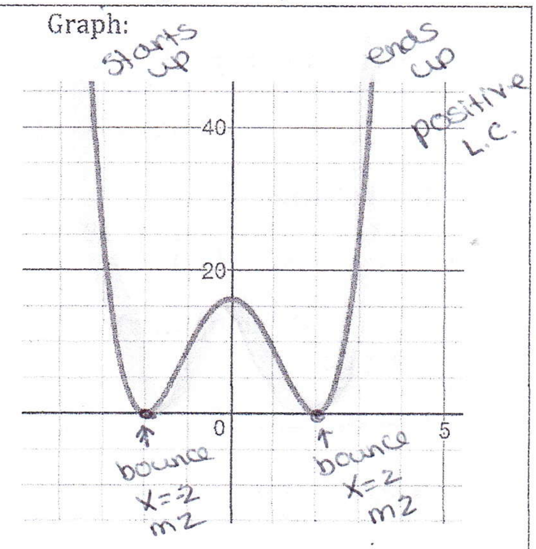
Value of leading co-efficient: 1

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

Range: $[0, \infty)$

Other: $f(0) = 16$

Graph:



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