

Precalculus
4.1-4.3 Partner Test 2013
Non-Calculator

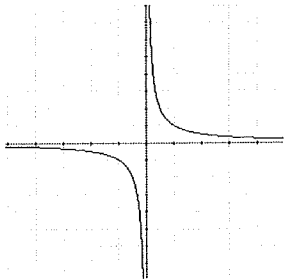
Names: _____ / _____
_____ / _____

1. Is the algebraic expression $4x^2 + 3\sqrt{x} + 5x^{-1}$ a polynomial?

1. Yes or No

2. Is the graph below that of a polynomial function?

2. Yes or No



3. Use synthetic division to find the quotient and remainder:
 $4x^4 - 2x^2 + 3x + 7 \div x - 2$. **Show your work.**

3. _____

4. Is $x + 1$ a factor of $x^{25} - x^{20} - 2x^{10} + x^5 + 2x - 3$?
If not, what is its remainder? **Show your work.**

4. Yes or No

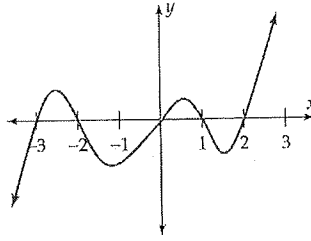
If not what is the remainder

5. Is $x^2 + 4$ a factor of $3x^4 + 2x^3 - 6x + 4$?
If not, what is its remainder? **Show your work.**

5. Yes or No

If not what is the remainder

6. Find a 5th degree polynomial for the function shown here:
Leave your answer in factored form.



6. _____

7. Find a 4th degree polynomial with zeros at 2 and -1 .
Leave your answer in factored form.

7. _____

8. Find the value of k if $x - 3$ is a factor of
 $x^4 - 5x^3 - kx^2 + 18x + 18$.

8. _____

9. Determine if 2 is an upper bound, lower bound, or neither:
 $x^3 + 2x^2 - 7x + 20$. **Show your work.**

9. _____

10. Find all the rational zeros of $2x^4 - 13x^3 + 18x^2 + 13x - 20$.

10. _____

11. Find all real zeros of $x^3 + 4x^2 - 2x - 5$.

11. _____

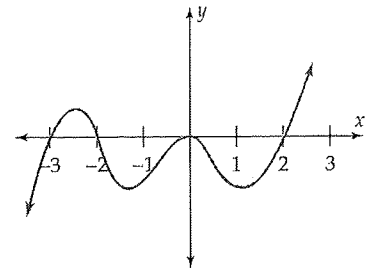
12. Find A. rational zeros B. real zeros and C. factor completely $x^6 - 2x^5 - 4x^2 + 8x$
Show all work!

A. _____ B. _____ C. _____
Rational zeros Real zeros Factor Completely

13. When the multiplicity of a zero is even,
the graph _____ at the zeros.
(Choose: touches or crosses)

13. _____

14. Use the graph shown below to answer the following questions.



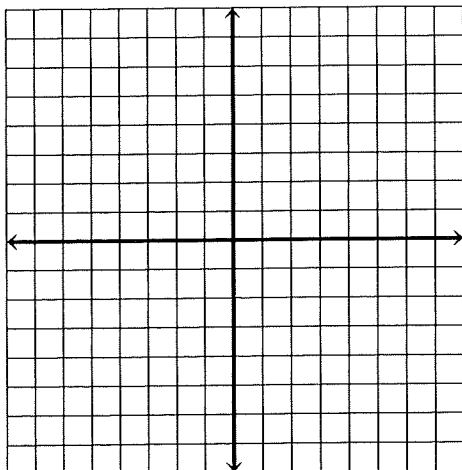
- a. State the least possible degree of the polynomial function. 14a. _____
- b. Is the leading coefficient positive or negative? 14b. _____
- c. Name the number of local extrema.(max/mins) 14c. _____
- d. Name the number of inflection points. 14d. _____
- e. State the zeros as they appear left to right. 14e. _____
- f. Write in factored form. Watch multiplicities. 14f. _____

15. Given $f(x) = (x+1)^3(x-5)^4(x-3)$:

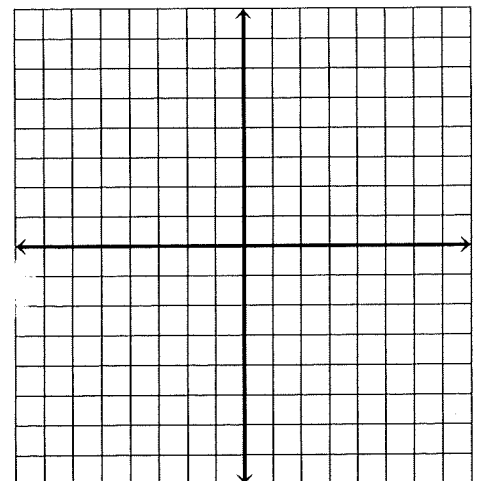
- a. State the zeros (in the order that they appear above). 15a. _____
- b. State whether the multiplicity of each zero is even or odd (in the order that they appear above). 15b. _____
- c. State whether the graph touches or crosses at each zero (in the order that they appear above). 15c. _____

16. Sketch a graph the polynomial function. Use your knowledge of zeros, multiplicity, and left and right behavior. Be complete and neat!

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



$$f(x) = -\frac{1}{2}x(x-3)^2(x+2)$$



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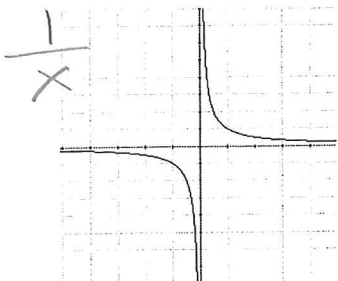
Names: Key / _____

1. Is the algebraic expression $4x^2 + 3\sqrt{x} + 5x^{-1}$ a polynomial?

+1 1. Yes or No

2. Is the graph below that of a polynomial function?

+1 2. Yes or No



$\sqrt{2}x^3$ ~~$x^{1/2}$~~ ~~x^x~~

3. Use synthetic division to find the quotient and remainder:
 $4x^4 - 2x^2 + 3x + 7 \div x - 2$. Show your work.

+3 3. $4x^3 + 8x^2 + 14x + 31 + \frac{69}{x-2}$

$$\begin{array}{r|rrrrrr} 2 & 4 & 0 & -2 & 3 & 7 \\ & & 8 & 16 & 28 & 62 \\ \hline & 4 & 8 & 14 & 31 & 69 \end{array}$$

$$4x^3 + 8x^2 + 14x + 31 + \frac{69}{x-2}$$

4. Is $x+1$ a factor of $x^{25} - x^{20} - 2x^{10} + x^5 + 2x - 3$?
If not, what is its remainder? Show your work.

+1 4. Yes or No
+2 $\frac{-10}{x+1}$
If not what is the remainder

$$\begin{aligned} & (-1)^{25} - (-1)^{20} - 2(-1)^{10} + (-1)^5 + 2(-1) - 3 \\ & -1 - 1 - 2 - 1 - 2 - 3 = -10 \end{aligned}$$

5. Is $x^2 + 4$ a factor of $3x^4 + 2x^3 - 6x + 4$?
If not, what is its remainder? Show your work.

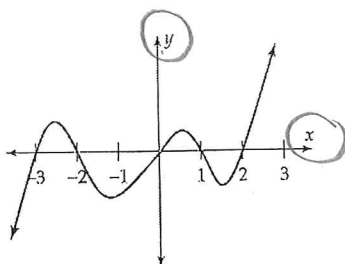
+1 5. Yes or No
+2 $\frac{-14x + 52}{x^2 + 4}$
If not what is the remainder

$$\begin{array}{r} 3x^2 \\ x^2 + 0x + 4 \overline{) 3x^4 + 2x^3 + 0x^2 - 6x + 4} \\ \underline{3x^4 + 0x^3 + - 12x + 16} \\ + 2x^3 + - 6x - 12 \end{array}$$

25
25

||

6. Find a 5th degree polynomial for the function shown here:
Leave your answer in factored form.



$$y =$$

$$6. \underline{f(x) = (x+3)(x+2)(x)(x-1)(x-2)}$$

+3

7. Find a 4th degree polynomial with zeros at 2 and -1.
Leave your answer in factored form.

$$+3 \underline{7. \frac{(x-2)^2(x+1)^2}{(x-2)^3(x+1)^3}}$$

8. Find the value of k if $x-3$ is a factor of $x^4 - 5x^3 - kx^2 + 18x + 18$.

$$+2 \underline{8. K=2}$$

$$f(3) =$$

$$3^4 - 5(3)^3 - k(3)^2 + 18(3) + 18 = 0$$

$$81 - 135 - 9k + 54 + 18 = 0$$

$$-9k + 18 = 0$$

$$-9k = -18$$

9. Determine if 2 is an upper bound, lower bound, or neither: $x^3 + 2x^2 - 7x + 20$. **Show your work.**

$$+2 \underline{9. \text{upper}}$$

$$\begin{array}{r|rrrr} 2 & 1 & 2 & -7 & 20 \\ & & 2 & 8 & 2 \\ \hline & 1 & 4 & 1 & 22 \end{array}$$

10. Find all the rational zeros of $2x^4 - 13x^3 + 18x^2 + 13x - 20$.

$$10. \underline{1, -1, 4, 5/2}$$

$$\underline{\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20}$$

$$\pm 1, \pm 2$$

+4

$$\begin{array}{r|rrrrr} 1 & 2 & -13 & 18 & 13 & -20 \\ & & 2 & -11 & 7 & +20 \\ \hline & 2 & -11 & 7 & 20 & 0 \end{array}$$

$$(x-1)(2x^3 - 11x^2 + 7x + 20)$$

$$\begin{array}{r|rrrr} -1 & 2 & -11 & 7 & 20 \\ & & -2 & 13 & -20 \\ \hline & 2 & -13 & 20 & 0 \end{array}$$

$$2x^2 - 13x + 20$$

$$(2x-5)(x-4)$$

$$\begin{array}{r|rr} 4 & 2 & -13 & 20 \\ & & 8 & -26 \\ \hline & 2 & -5 & 0 \end{array}$$

$$2x - 5 = 0$$

$$x = 5/2$$

14

11. Find all real zeros of $x^3 + 4x^2 - 2x - 5$.

11. $-1, \frac{-3 \pm \sqrt{29}}{2}$

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

+4

$$x^2 + 3x - 5 = 0$$

$$x = \frac{-3 \pm \sqrt{9 + 20}}{2} = \frac{-3 \pm \sqrt{29}}{2}$$

12. Find A. rational zeros B. real zeros and C. factor completely $x^6 - 2x^5 - 4x^2 + 8x$
Show all work!

$$x(x^5 - 2x^4 - 4x + 8)$$

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

$$\begin{aligned} x(x-2)(x^4-4) &= 0 \\ (x^2-2)(x^2+2) &= 0 \\ x(x-2)(x^2-2)(x^2+2) & \end{aligned}$$

+9

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

A. 0, 2
Rational zeros

B. 0, 2 ± √2
Real zeros

C. f(x) = x(x-2)(x+√2)(x-√2)(x^2+2)
Factor Completely

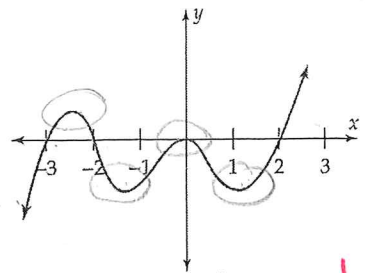
0, 2 ± √2, ±√2i
all zeros

13. When the multiplicity of a zero is even, the graph _____ at the zeros.
(Choose: touches or crosses)

+2 13. Touches

15

14. Use the graph shown below to answer the following questions.



a. State the least possible degree of the polynomial function.

14a. 5 +1

b. Is the leading coefficient positive or negative?

14b. + +1

c. Name the number of local extrema.(max/mins)

14c. 4 +1

d. Name the number of inflection points.

14d. 3 +1

e. State the zeros as they appear left to right.

14e. -3, -2, 0, 2 +1

f. Write in factored form. Watch multiplicities.

14f. $y = (x+3)(x+2)(x)^2(x-2)$ +2

15. Given $f(x) = (x+1)^3(x-5)^4(x-3)$:

a. State the zeros (in the order that they appear above).

15a. -1 5 3

b. State whether the multiplicity of each zero is even or odd (in the order that they appear above).

15b. odd even odd

c. State whether the graph touches or crosses at each zero (in the order that they appear above).

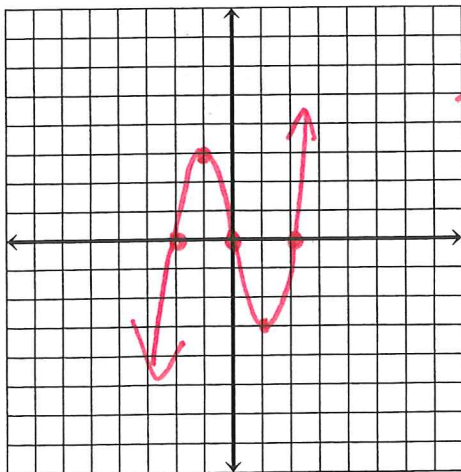
15c. cross touch cross

16. Sketch a graph the polynomial function. Use your knowledge of zeros, multiplicity, and left and right behavior. Be complete and neat!

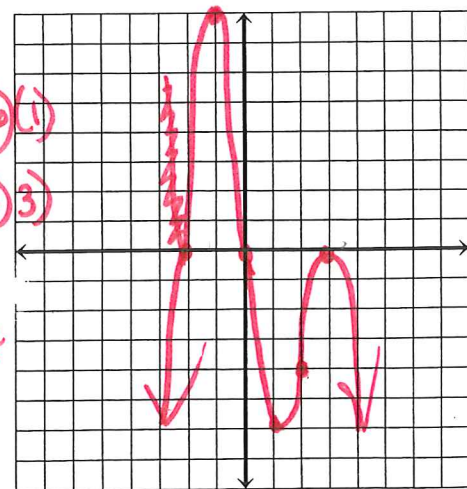
$f(x) = x^3 - 4x$ ~~4x~~ $x(x^2-4)$ $x(x-2)(x+2)$

$f(x) = -\frac{1}{2}x(x-3)^2(x+2)$ $\text{degree is } 4$

$$\begin{array}{r|l} x & y \\ -1 & -1+4 \\ 1 & 1-4 \end{array}$$



$$\begin{array}{r|l} -1 & -\frac{1}{2}(-1)(16)(1) \\ 1 & -\frac{1}{2}(1)(4)(3) \\ 2 & -\frac{1}{2}(2) \\ & -1(1)4 \end{array}$$



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