Questions on Lesson 5.3?

We will be taking our first content mastery quiz for quarter 2 in a few minutes!

$f(x) = x^3$

$j(x) = x^3 - 5$
↓ 5

$m(x) = x^3 + 1$
↑ 1

$n(x) = -x^3$
reflect across x-axis

$g(x) = 2x^3$
dilation of 2

$h(x) = (x+7)^3$
← 7

$k(x) = (x-6)^3$
→ 6

$p(x) = 7(x-2)^3 + 4$
dilated by 7
→ 2
↑ 4

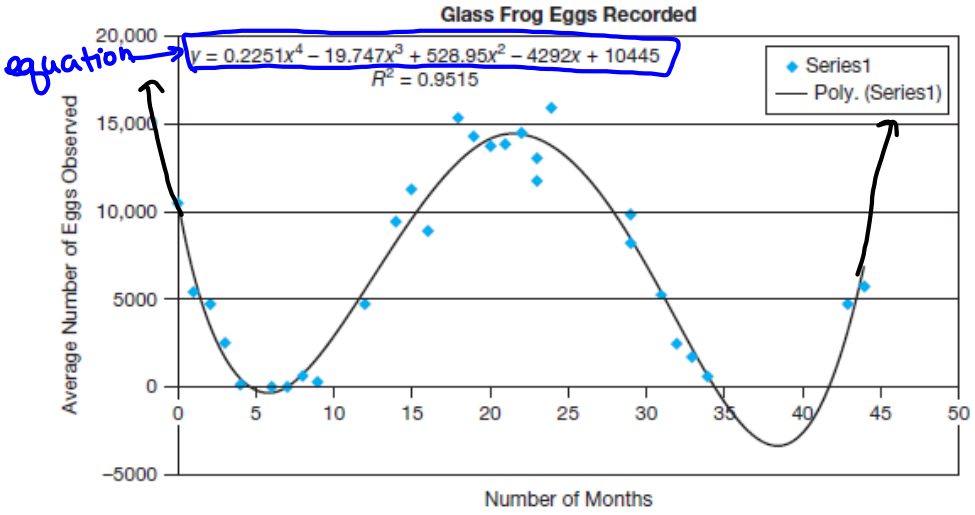
$(2x)^3 = 8x^3$
$2x^3$

Polynomial DNA
Key Characteristics of Polynomial Functions

5.4

PG.370-71 IN YOUR BOOK

The data has been plotted for you and a quartic regression was used to generate the polynomial function to best represent the data. The quartic regression option calculates the best-fit equation of the form $y = ax^4 + bx^3 + cx^2 + dx + e$.



1. Consider the graph and equation to answer each question.

   a. What is the domain and range of the study? (table 4)
   D: [0, 44] R: [108.4, 15966.9]

   b. Explain what the domain and range represent in the context of this problem.
   D-number of months / R: Average # of frog eggs observed

   c. What is the domain and range of the function? (curve)
   D: (−∞, ∞) / R: [−3096.3, ∞)

   d. At what month in the study were the most frog eggs observed? How many eggs were recorded?
   24 → 15966.9

   e. At what month in the study were the least frog eggs observed? How many eggs were recorded?
   7 → 108.4

   f. If the study lasted for 50 months, how many frog eggs would there be according to the function?
   $f(50) = 0.2251(50)^4 - 19.747(50)^3 + 528.95(50)^2 - 4292(50) + 10445$
   $f(50) = 56{,}720$

   g. If the study lasted forever, how many eggs would there be according to the function?
   infinite amount of eggs

   h. How many frog eggs appeared between months 35 and 40?
   a negative amount

   i. At what month(s) of the study were there approximately 4800 glass frog eggs observed?
   43, 12, 2(?)

Oct 9-8:12 AM

PG.371-372 IN YOUR BOOK

2. Use a graphing calculator to determine the *x*-intercepts of the function. What do the *x*-intercepts mean in the context of this problem situation?

$x = 4.7, 6.8, 34.5, 41.7$ no eggs at these months.

3. State the end behavior of the function. Does this make sense in the context of this problem scenario? Explain your reasoning.

As $x \to \infty$, $f(x) \to \infty$

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

No, it is impossible to have an infinite # of frog eggs.

4. How many frog eggs were observed at the beginning of the study? Explain the mathematical meaning of your answer.

10,534 y-intercept

5. Describe the interval when the frog's egg population is:

   a. increasing.

   b. decreasing.

PG.372 IN YOUR BOOK

So far in this chapter, you have learned a great deal about polynomial functions. You have learned about minimums, maximums, zeros, end behavior, and the general shapes of their graphs. Now, you will combine all that information to generalize the key characteristics for any degree polynomial.

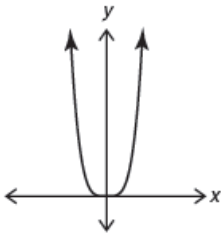
Recall the definition of a relative maximum is the highest point in a particular section of a function's graph, and a relative minimum is the lowest point in a particular section of the graph. Similarly, the **absolute maximum** is the highest point in the entire graph, and the **absolute minimum** is the lowest point in the entire graph. The set of absolute maximums, absolute minimums, relative maximums, and relative minimums may also be referred to as **extrema**. The extrema are also called extreme points and extremum.

PG.373 IN YOUR BOOK

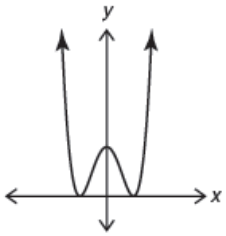
2. Determine the number of extrema in each polynomial.

4th Degree Polynomials

$g_1(x) = x^4$



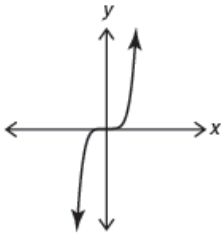
$g_2(x) = x^4 - 3x^2$



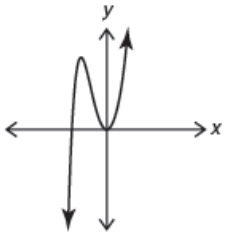
Number of Extrema _____ _____

5th Degree Polynomials

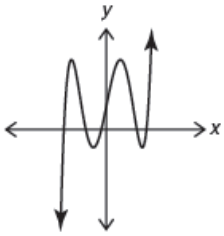
$f_1(x) = x^5$



$f_2(x) = x^5 + 4x^2$



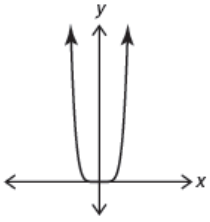
$f_3(x) = x^5 - 5x^3 + 5x + 1.18$



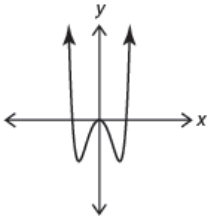
Number of Extrema _____ _____ _____

6th Degree Polynomials

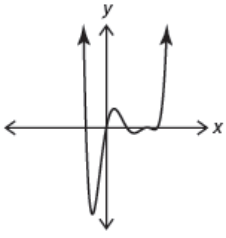
$h_1(x) = x^6$



$h_2(x) = x^6 - 3x^2$



$h_3(x) = 2x^6 - 13x^5 + 26x^4 - 7x^3 - 2$



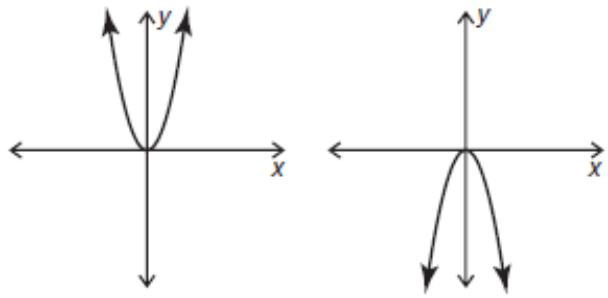
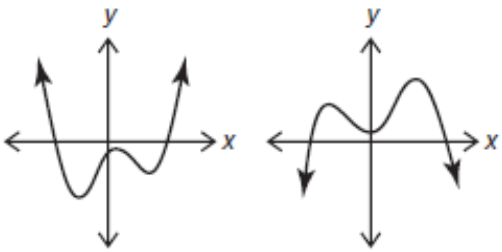
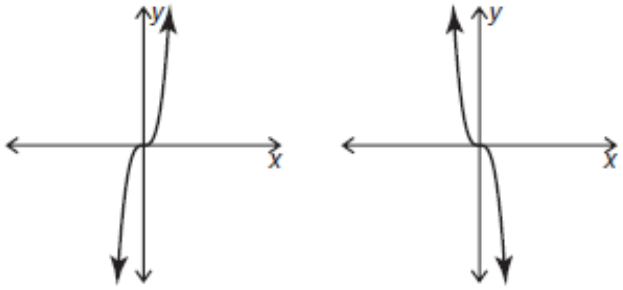
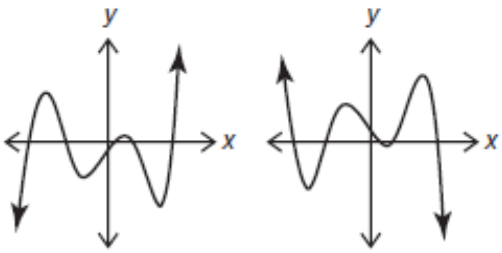
Number of Extrema _____ _____ _____

Take 5 mins to finish pg.374 in your book

Oct 9-8:14 AM

PG.375 IN YOUR BOOK

6. Analyze the graphs shown.

Even Degree Power Functions	Even Degree Polynomial Functions
	
Odd Degree Power Functions	**Odd Degree Polynomial Functions**
	

a. State the similarities and differences you notice between the power functions and the polynomial functions.

b. What conclusions can you make about the end behavior of all even degree polynomial functions?

c. What conclusions can you make about the end behavior of all odd degree polynomial functions?

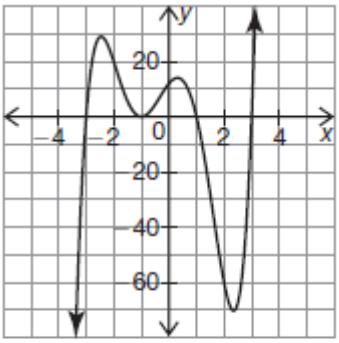
d. What conclusions can you make about the domain and range of all even degree polynomial functions?

e. What conclusions can you make about the domain and range of all odd degree polynomial functions?

Oct 21-8:47 AM

PG.376 IN YOUR BOOK

7. Consider the graph shown.



a. Is the *a*-value of this function positive or negative?

b. Is the degree of this function even or odd?

c. Can this function be a cubic function? Explain why or why not.

d. State the domain of this function.

e. State the range of this function.

f. Determine the number of relative extrema in this graph.

g. Determine the number of absolute extrema in this graph.

h. State the intervals where the graph is increasing.

Oct 21-8:49 AM

*Complete #9 on pg.378 and fill in the table on pg.379

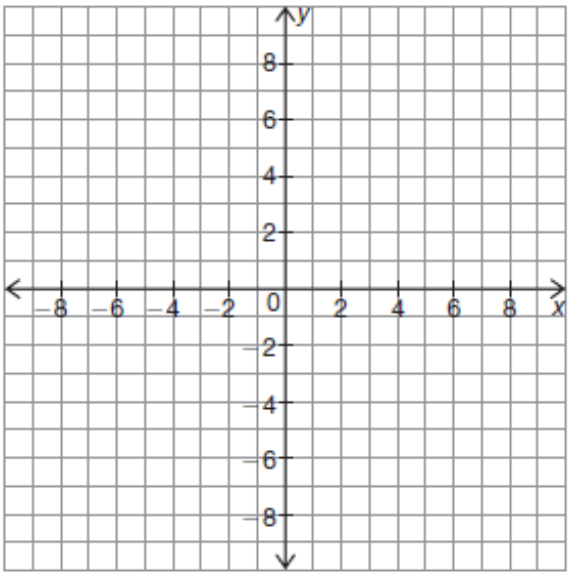
Oct 21-8:49 AM

PG.380 IN YOUR BOOK

1. Use the coordinate plane to sketch a graph with the characteristics given. If the graph is not possible to sketch, explain why.

   a. Characteristics:

   - degree 4
   - starts in quadrant III
   - ends in quadrant IV
   - relative maximum at $x = -4$
   - absolute maximum at $x = 3$



finish pgs. 380-381 in your book with your group

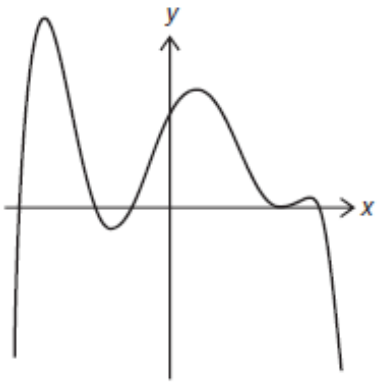
Oct 21-8:49 AM

PG.382 IN YOUR BOOK

2. Analyze each graph. Circle the function(s) which could model the graph. Describe your reasoning to either eliminate or choose each function.

a.

$f_1(x) = -3x^5 - 2x^2 + 4x + 7$



$f_2(x) = -(x + 2)(x + 1.5)(x + 0.5)(x - 2.5)^2 (x - 3)$

$f_3(x) = -3x^4 - 2x^2 + 4x + 7$

Oct 21-8:49 AM

Homework

Finish lesson 5.4

Aug 24-2:00 PM