BIG PICTURE of this Unit

- How can we extend our algebra skills to interchange between standard and factored form of polynomial equations? (i.e. synthetic division, factoring)
- Can we use our new polynomial algebra skills in order to find a method for solving EVERY polynomial equation (especially those that don't factor?)
- How can use the equation of a polynomial to analyze for key features of a graph of a polynomial (i.e. end behavior, multiplicity of roots, optimal points, intervals of increase/decrease).
- When and how can polynomial functions be used to model real world scenarios?

1. (CI) Now that you understand the importance of (i) factors & roots, (ii) multiplicities of zeroes & (iii) end behaviour, prepare sketches of the following polynomials. In your sketches, pay attention to the correct end behaviour and the appearance of each graph as it crosses the x-axis. {6}

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

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

   c. $f(x) = (x-3)^2(x-1)(x+5)^2$

   d. $f(x) = (x+3)(x-6)^3(x+7)(x-1)(x+4)$

2. (CI) Working with the parent function $y = \frac{1}{x}$, you will apply the following transformations and determine: {7}

   i. Ex #1 ➔ the parent function has been moved left by 5, down by 3.

   ii. Ex #2 ➔ the parent function has been moved right by 2, up by 4 and vertically stretched by a factor of 3.

   iii. Ex #3 ➔ the parent function has been reflected across the x-axis and then moved up 3.

   a. the equation of the asymptotes in each of i, ii, iii

   b. the "new" location for the "original" points of (1,1) and (-1,-1) in each of i, ii, iii

   c. The new equation, given the transformations. Write the equation in "transformational form" and in "linear/linear" form in each of i, ii, iii

   d. the x- and y-intercepts of the transformed function in each of i, ii, iii

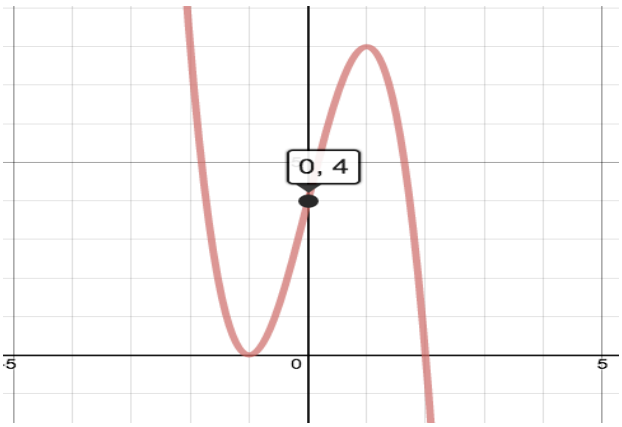
   e. sketch the new, transformed function in each of i, ii, iii

3. (CI) From the following graphs, {5,15}

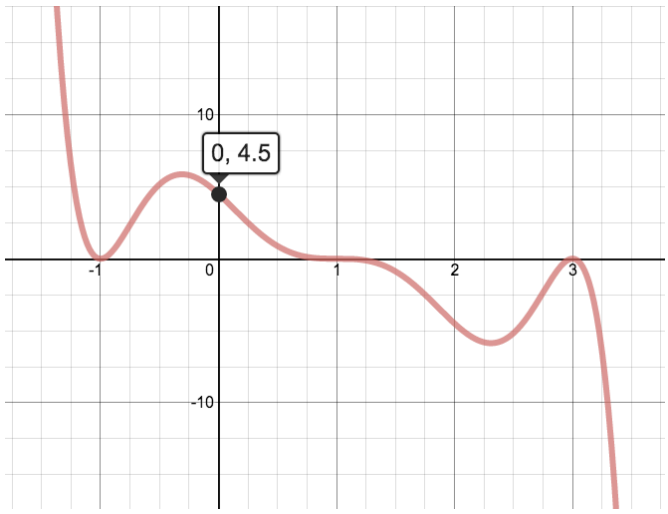
   a. determine the equation of the polynomial, $p(x)$, in both factored and standard form.

   b. Solve the inequality $p(x) < 0$.

a.



b.



4. Completely factor each of the following polynomials, given some information about the polynomial. {11,13}

   a. Factor $p(x) = 5x^3 + 9x^2 - 26x - 24$, given that $(x + 3)$ is one factor of $p(x)$

   b. Factor $p(x) = 6x^3 + 7x^2 - 1$, given that $p(-0.5) = 0$.

   c. Factor $p(x) = 5x^3 + 4x^2 - 20x - 16$, given that x = 2 is one of the zeroes.

   d. Factor $p(x) = 2x^4 - 11x^3 + 20x^2 - 12x$, given that $x = 2$ is a double root.

5. Given this data (number of students at Juan Fine High School), calculate the second and third differences. {3,4,8}

Year	1998	1999	2000	2001	2002	2003	2004	2005
# of children	3204	3165	3187	3268	3391	3527	3654	3744

   a. HENCE, decide whether the data set is best modelled by a quadratic function or a cubic function.

   b. Use your TI-84 to determine the quadreg and cubicreg equations for the data set. Record the equations and the coefficient of determination (r^2) from your calculator (turn stat diagnostics on).

   c. According to your calculator, is a quadratic model or cubic model more appropriate? How do you know?

6. (CA) The cost C in dollars to remove p% of the invasive species of IttyBitty fishy from Sasquatch Pond is given by $C(p) = \frac{1770p}{100 - p}$, where $0 \le p < 100$. {4,8}

   a. Find and interpret C(25) and C(95).

   b. What does the vertical asymptote at x = 100 mean within the context of the problem?

   c. What percentage of the IttyBitty fishy can you remove for $40,000?

   d. How much does it cost to remove the first 10% of the fish? How much does it cost to remove the last 10% of the fish? Why would/should these costs be different?

   e. How much would it cost to so that only 25% of the fish remain?

   f. Include a sketch of this cost function in your notes.

Higher Level Questions for More Complex Concepts OR an EXTENSION of basic concepts involved with Polynomial and Rational Functions.

1. (CI) Solve the following equations for $x \in C$.

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

   b. $0 = x^4 - x^3 - 3x^2 - 9x - 108$

   c. $1 - x = 4x^3 - 4x^2$

   d. $-4x - 13 = x^4 + 4x^3 + 14x^2$, knowing that $x = i$ is one of the solutions.

2. (CI) A cubic function has two of its zeroes at -6 and $\sqrt{3}i$ and its y-intercept is (0, 6). Determine the vertical distance between its local extrema.