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Algebra 2 / 5
Effi
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Mini-Project on Polynomials

Work:

Polynomial A:

Zeros (x-intercepts): (1,0), (10,0)
Scalar: (3/22)
Factored form: $y = (3/22)(x-1)(x-10)$
Minimum 1: $x = 5.5$, $y = -2.8$
Maximum: N/A
Expanded form work:

$y = (3/22)(x-1)(x-10)$
$y = (3/22)(x^2-11x+10)$
$y = (3/22)x^2-(3/2)x+(15/11)$

Final Expanded form: $y = (3/22)x^2-(3/2)x+(15/11)$
Matches factored form on graph?: Yes

Polynomial B:

Zeros (x-intercepts): (-9.5,0), (3.5,0), (6.5,0)
Scalar: (3/183)
Factored form: $y = (3/183)(x + 9.5)(x-3.5)(x-6.5)$
Minimum: $x = 5$, $y = -0.5$
Maximum: $x = -4.8$, $y = 7.2$
Expanded form work:

$y = (3/183)(x + 9.5)(x-3.5)(x-6.5)$
$y = (3/183)(x^2-3.5x+9.5x-33.25)(x-6.5)$
$y = (3/183)(x^2+6x-33.25)(x-6.5)$
$y = (3/183)(x^3-6.5x^2+6x^2-39x-33.25x+216.125)$
$y = (3/183)(x^3-(½)x^2-72.25x+216.125)$
$y = (3/182)x^3-(1/122)x^2-(289/244)x+(1729/488)$

Final Expanded form: $y = (3/182)x^3-(1/122)x^2-(289/244)x+(1729/488)$
Matches factored form on graph?: Yes

Zeros and Local Minimum / Maximum:

There are two necessary aspects used to find an equation for a plotted polynomial: the zeros and local minimum / local maximum. Here I endeavor to explain both of these approaches. I also provide examples.

A zero of a polynomial function is the coordinates or location of where the polynomial intercepts or crosses the x-axis (i.e., horizontal line) on a coordinate plane (i.e., x-y grid). If a polynomial crosses the x-axis multiple times, there are multiple zeros. In this situation, multiple zeros exist because there are multiple coordinates. If you look at Polynomial B on the accompanying graph, you see that the line crosses the x-intercept at (-9.5,0), (3.5,0), (6.3,0). These are the zeros.

The next essential part is finding the local minimum and/or maximum of your polynomial. The local maximum (or minimum) of the turning point (that is the curve) is the y-coordinate and is the highest (or lowest) point compared to all nearby points.

To find the local minimum / maximum it is necessary to find a point (that is coordinate) on the arch of the curve. More than likely, the point doesn't lie directly on a grid intersection, so it will be necessary to use a graphing calculator. The TI-84 Plus is ideal for this procedure, but any graphing calculator will do.

To graph a polynomial (in the example below, Polynomial A), you need to write the zeros in factored form. To do this, take each of the x-coordinates and subtract them from x, multiply them by each other, and make the whole equation equal to y. In Polynomial A, the zeros are: (1,0), and (10,0). This is what it looks like written in factored form:

$$y = (x-1)(x-10)$$

If you have a zero that has a negative value (-1,0 or-2,0 for example), you use the opposite operation. Using the opposite means that a polynomial with zeros (x-intercepts) of (**-**1,0), and (**-**2,0) is written as:

$$y = (x+10)(x+2)$$

This new equation can now be entered into the calculator. Once you've graphed the polynomial, you can use the "Calculate" feature. These steps are explained below.

Using a TI-84 Plus (or any other graphing calculator), complete the following steps:

1.) Press "Y="
2.) Enter your polynomial in factored form
3.) Press "Graph" to make your polynomial visible in your calculator's window
4.) Press "2ND" and then "CALC"

5.) Select which you would like to calculate (“Minimum” or “Maximum”)

6.) Move the cursor to the lower left side of the curve (using the arrow keys) and press “ENTER.”

7.) Move the cursor to the lower right side of the curve (using the arrow keys) and press “ENTER.”

8.) Move the cursor to your best approximate guess of where the highest (or lowest) point is and press “ENTER”

9.) Record the given values.

Following the above steps, you should get (5.5, -2.8) for the local minimum.