Name:_____

The polynomial $p(x) = 2x^3 + 13x^2 + 17x - 12$ has $(x + 4)$ as a factor. Factor the polynomial into three linear factors. Describe the steps you would use to sketch the graph of the function defined by this polynomial. Identify all intercepts and describe the end behavior of the graph.

Enter your factored polynomial, your description, and your answers in the space provided.

Sample student solution

To find the linear factors I would first do long division and find the quadratic factor

$$
\begin{array}{r}
2x^2 + 5x - 3 \\
x + 4 \overline{\smash{\big)}\ 2x^3 + 13x^2 + 17x - 12} \\
\underline{2x^3 + 8x^2} \\
5x^2 + 17x \\
\underline{5x^2 + 20x} \\
-3x - 12 \\
\underline{-3x - 12} \\
0 \ \text{Remainder}
\end{array}
$$

I will use the quadratic factor to find the linear factors by factoring.

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

$$= (x + 4)\,[2x(x + 3) - 1(x + 3)]$$

$$= (x + 4)(2x - 1)(x + 3)$$

$x + 4 = 0$	$2x - 1 = 0$	$x + 3 = 0$
$x = -4$	$2x = 1$	$x = -3$
	$x = 1/2$	

The zeroes are as follows: (-4, 0)   (0.5, 0)   (-3,0)

The y intercept is (0, -12). I found it by substituting x = 0

Since the leading coefficient ta is positive the end behavior of the function is as follows

As $x \rightarrow \infty,\ p(x) \rightarrow \infty$ and   As $x \rightarrow -\infty,\ p(x) \rightarrow -\infty$

I would first plot the zeroes on the x – axis, then plot the y intercept. I will draw an arrow going down in the third quadrant and an arrow going up on the first quadrant. My graph will intersect the x axis at -4 and -3 and it will be concave down between -4 and -3. My graph then will start to go up and t intersect the y axis at -12 then intersect the x-axis at 0.5 and then keep going up.

Rubrics

1 point for finding the correct linear factors

1 point for describing or showing how to find the linear factors

1 point for finding the zeroes, y intercept,

1 point for Describing end behavior correctly

1 point for explaining how to graph the polynomial using intercept and end behavior.

Points	Genesis Conversion
0	55
1	59
2	69
3	79
4	89
5-6	100