

PART 1: END BEHAVIOR

1. What is the degree of the polynomial $f(x) = 5(x - 2)^2(x + 4)(x - 5)^3$? Explain how you know.

Degree = 6 b/c $2 + 1 + 3 = 6$

2. What is the leading coefficient of $f(x) = 5(x - 2)^2(x + 4)(x - 5)^3$.

LC = 5

3. a. Explain why $5x^6 \rightarrow \infty$ as $x \rightarrow \pm\infty$.

Because if $x \rightarrow \infty$, then $5x^6 \rightarrow \infty$,
and if $x \rightarrow -\infty$, then $5x^6 \rightarrow \infty$

(If you plug in big positive #'s)

(You get big positive answers)

b. Hence, describe the END BEHAVIOR of $f(x) = 5(x - 2)^2(x + 4)(x - 5)^3$.

(If you plug in big negative #'s)

(You still get big positive answers b/c an even number of negatives = positive)

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

4. What is the degree and leading coefficient of $g(x) = -10x(x - 3)^4$?

Degree = 5, LC = -10

5. a. Explain why $-10x^5 \rightarrow \infty$ as $x \rightarrow -\infty$ and $-10x^5 \rightarrow -\infty$ as $x \rightarrow \infty$.

Because if x is a big negative #, then $-10x^5$ is a big positive #.
And, if x is a big positive #, then $-10x^5$ is a big negative #.

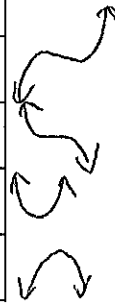
b. Hence, describe the END BEHAVIOR of $g(x) = -10x(x - 3)^4$.

As $x \rightarrow \infty, g(x) \rightarrow -\infty$
As $x \rightarrow -\infty, g(x) \rightarrow \infty$

6. GENERALIZATION:

END BEHAVIOR of polynomial depends on the DEGREE (odd or even) and LEADING COEFFICIENT (positive or negative). Complete the table:

Degree	Leading Coefficient	END BEHAVIOR
ODD	Positive	As $x \rightarrow \infty, y \rightarrow \infty$ As $x \rightarrow -\infty, y \rightarrow -\infty$
ODD	Negative	As $x \rightarrow \infty, y \rightarrow -\infty$ As $x \rightarrow -\infty, y \rightarrow \infty$
EVEN	Positive	As $x \rightarrow \infty, y \rightarrow \infty$ As $x \rightarrow -\infty, y \rightarrow \infty$
EVEN	Negative	As $x \rightarrow \infty, y \rightarrow -\infty$ As $x \rightarrow -\infty, y \rightarrow -\infty$



PART 2: MULTIPLICITY

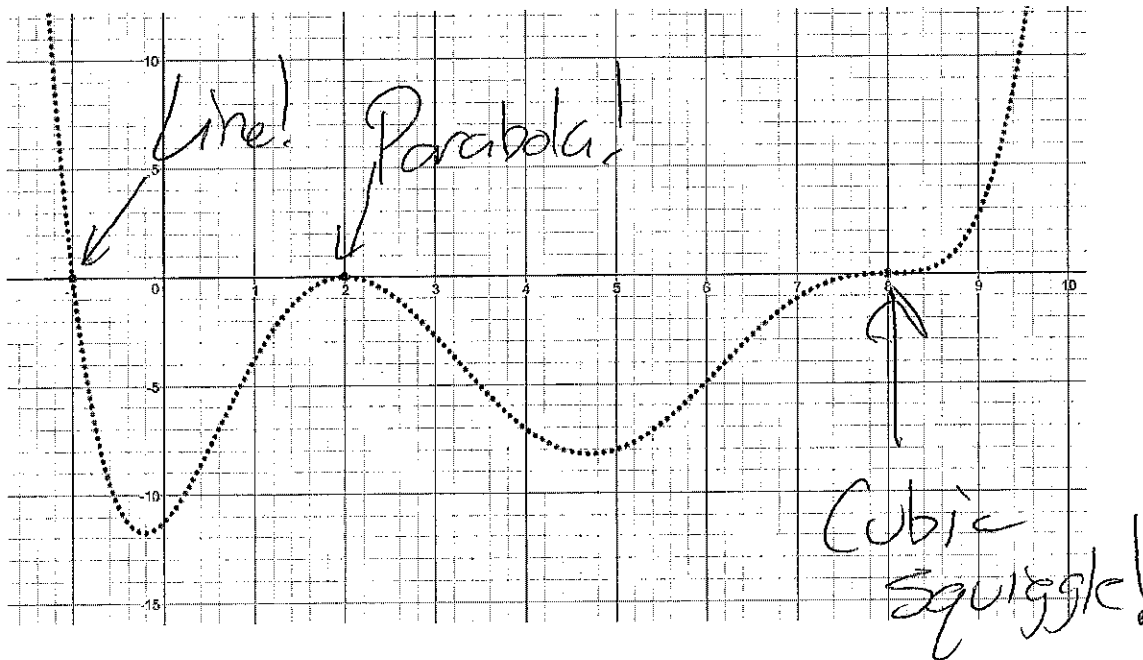
7. What are the roots of $f(x) = 0.0055(x - 2)^2(x + 1)(x - 8)^3$?

2, -1, 8

8. What is the MULTIPLICITY of each root from #7?

2, 1, 3

9. The graph of $f(x) = 0.0055(x - 2)^2(x + 1)(x - 8)^3$ is shown below. The BEHAVIOR AT A ROOT depends on the MULTIPLICITY. Describe what the function looks like AT THE ROOT for each x-intercept. Use the MULTIPLICITY as a reference for your description.



10. Which function best fits the graph shown?

Explain your choice.

a. $f(x) = x(x + 5)^2(x + 2)^3$

b. $f(x) = x^2(x + 5)^3(x + 2)$

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

d. $f(x) = x(x + 5)^3(x + 2)^2$

