

## 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.
  
2. What is the leading coefficient of  $f(x) = 5(x-2)^2(x+4)(x-5)^3$
  
3.
  - a. Explain why  $5x^6 \rightarrow \infty$  as  $x \rightarrow \pm \infty$ .
  
  - b. Hence, describe the END BEHAVIOR of  $f(x) = 5(x-2)^2(x+4)(x-5)^3$ .
  
4. What is the degree and leading coefficient of  $g(x) = -10x(x-3)^4$ ?
  
5.
  - a. Explain why  $-10x^5 \rightarrow \infty$  as  $x \rightarrow -\infty$  and  $-10x^5 \rightarrow -\infty$  as  $x \rightarrow \infty$ .
  
  - b. Hence, describe the END BEHAVIOR of  $g(x) = -10x(x-3)^4$ .
  
6. GENERALIZATION:  
END BEHAVIOR of polynomial depends on the DEGREE (odd or even) and LEADING COEFFICIENT (positive or negative). Complete the table:

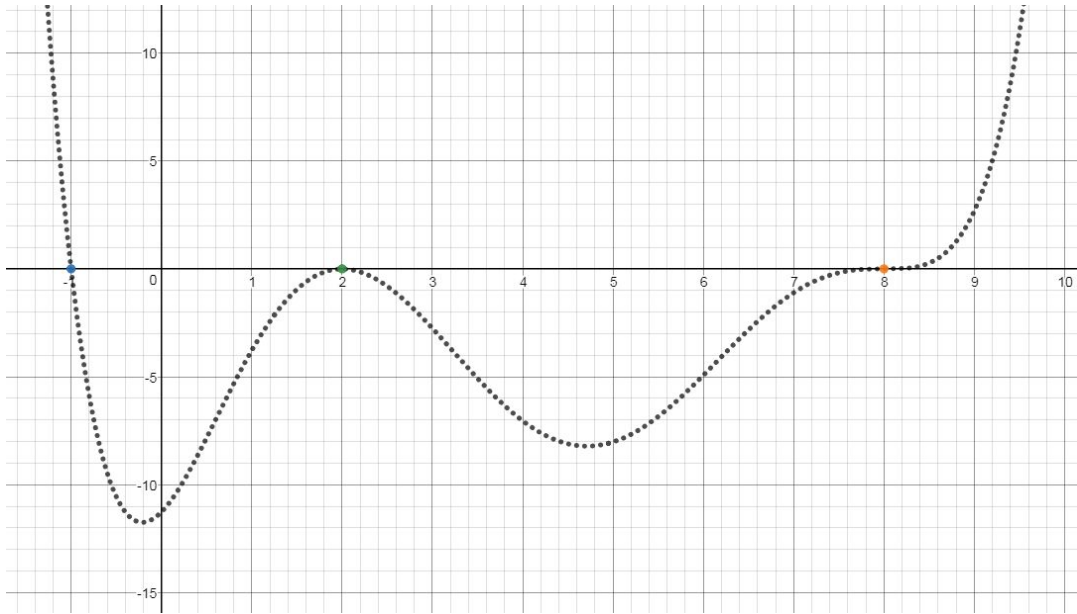
| Degree | Leading Coefficient | END BEHAVIOR |
|--------|---------------------|--------------|
| ODD    | Positive            |              |
| ODD    | Negative            |              |
| EVEN   | Positive            |              |
| EVEN   | Negative            |              |

PART 2: MULTIPLICITY

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

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

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

