END BEHAVIOR MODELS (§2.2)

An end behavior model of a polynomial uses only the leading coefficient and the variable of highest degree.

Example: An end behavior model of $h(x) = 6x^2 - 5x^3 + 7x - 8$ is $-5x^3$.

A rational function is two polynomials divided by each other. To find the end behavior model for a rational function, use the ratio of the end behavior models for each polynomial.

Example: An end behavior model of $g(x) = \dfrac{3x^2 + 5x - 7}{2x^3 - 5x^2 + x - 4}$ is $\dfrac{3}{2x}$.

It is easier to find the end behavior of the end behavior model than the original function.

USED TO FIND LIMITS AS $x \to \infty$ … Rational functions give us three possibilities

#1: The numerator has a higher degree

Example: $\lim_{x \to \infty} \frac{2x^3 + 3x + 1}{3x^2 - 7}$ is the same as $\lim_{x \to \infty} \frac{2x}{3}$ which does not exist.

RESULTS IN A SLANTED ASYMPTOTE … DIVIDE ORIGINAL FUNCTION

#2: The numerator and denominator have the same degree

Example: $\lim_{x \to \infty} \frac{2x^3 + 3x + 1}{3x^3 - 7}$ is the same as $\lim_{x \to \infty} \frac{2}{3} = \frac{2}{3}$.

RESULTS IN A HORIZONTAL ASYMPTOTE OF $y = \frac{2}{3}$.

#3: The denominator has higher degree

Example: $\lim_{x \to \infty} \frac{2x^3 + 3x + 1}{3x^4 - 7}$ is the same as $\lim_{x \to \infty} \frac{2}{3x} = 0$.

RESULTS IN A HORIZONTAL ASYMPTOTE OF $y = 0$.