Lesson 2.2 Math Lab: Assess Your Understanding, page 104

Use graphing technology to check your answers.

1. Without graphing, predict whether the graph of each function has a hole. State the related non-permissible value.
   a) \( y = \frac{x^2 - 16}{x + 4} \)
   \[ y = \frac{(x - 4)(x + 4)}{x + 4} \]
   The graph has a hole at \( x = -4 \).
   b) \( y = \frac{x^2 + 5}{x^2 - 25} \)
   \[ y = \frac{x^2 + 5}{(x - 5)(x + 5)} \]
   The graph does not have a hole.

2. Without graphing, predict the equations of any vertical asymptotes for the graph of each function.
   a) \( y = \frac{2x + 1}{x} \)
   \[ x = 0 \] is a vertical asymptote.
   b) \( y = \frac{x^2 - 2}{x^2 - 16} \)
   \[ y = \frac{x^2 - 2}{(x - 4)(x + 4)} \]
   \[ x = \pm 4 \] are vertical asymptotes.
   c) \( y = \frac{3x}{x^2 + 2} \)
   The denominator is always positive, so no vertical asymptote.
   d) \( y = \frac{x - 2}{x^2 + 7x + 10} \)
   \[ y = \frac{x - 2}{(x + 2)(x + 5)} \]
   \[ x = -2 \] and \( x = -5 \) are vertical asymptotes.

3. Without graphing, predict which graphs of these functions have horizontal asymptotes.
   a) \( y = \frac{x + 3}{2x^2 + 6x} \)
   The degree of the numerator is less than the degree of the denominator, so there is a horizontal asymptote.
   b) \( y = \frac{2x^2 + 6x}{x + 3} \)
   The degree of the numerator is greater than the degree of the denominator, so there is no horizontal asymptote.