

Graphing Rational Functions: Holes

Steps:

1. Factor completely & look for common factors to cancel.
2. If you can cancel a common factor, it creates a hole in the graph.
3. Set the cancelled factor = 0 & solve. (This is the x-coordinate of the hole)
4. Plug that x-value you just found into the remaining function & solve for y. (This is the y-coordinate of the hole.)
5. Write the hole as an ordered pair. (x, y)

Examples: Find the hole if possible.

$$1. f(x) = \frac{(x+2)(x-3)}{(x+2)(x-5)}$$

creates a hole

$$x+2=0 \quad f(x) = \frac{x-3}{x-5}$$

$$x = -2 \quad y = \frac{-2-3}{-2-5}$$

Hole
(-2, 5/7)

$$y = \frac{-5}{-7} = \frac{5}{7}$$

$$2. f(x) = \frac{x^2-4x-12}{x^2+3x+2}$$

$$f(x) = \frac{(x-6)(x+2)}{(x+2)(x+1)}$$

$$x+2=0 \quad f(x) = \frac{x-6}{x+1}$$

$$x = -2$$

$$y = \frac{-2-6}{-2+1} = \frac{-8}{-1} = 8$$

Hole
(-2, 8)

$$3. f(x) = \frac{x^2-4x}{x^2-5x+4}$$

$$y = \frac{x(x-4)}{(x-4)(x-1)}$$

$$x-4=0 \quad y = \frac{x}{x-1}$$

$$x = 4$$

Hole
(4, 4/3)

$$y = \frac{4}{4-1} = \frac{4}{3}$$

$$4. f(x) = \frac{2x}{x^2+2x+1}$$

$$y = \frac{2x}{(x+1)(x+1)}$$

No hole