



Polynomials and Rationals

Warmup:

1. Which of the following is **NOT** a possible combination of real and imaginary solutions for a cubic (5th degree) polynomial?

- A. 0 real, 5 imaginary
- B. 1 real, 4 imaginary
- C. 3 real, 2 imaginary
- D. 5 real, 0 imaginary

2. If $\frac{5}{x-2} - \frac{15}{x+4} = 0$, then = ?

- A. -3
- B. -1
- C. 3
- D. 5

$$\frac{5}{x-2} = \frac{15}{x+4} \Rightarrow 5(x+4) = 15(x-2)$$

$$5x + 20 = 15x - 30$$

$$-5x + 30 = -5x + 30$$

$$\frac{50}{10} = \frac{10x}{10}$$

$$x = 5$$

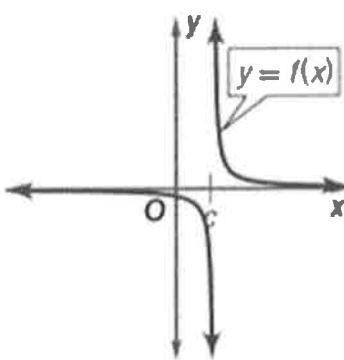
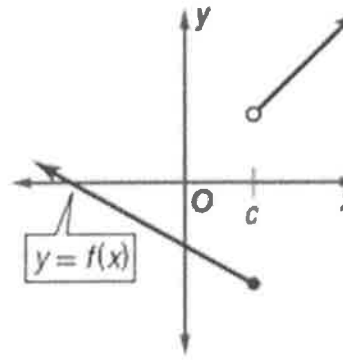
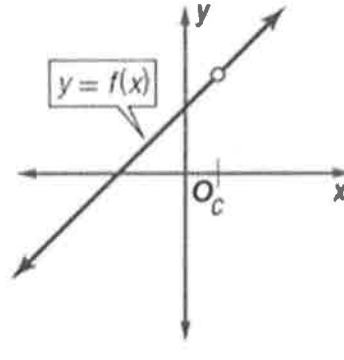
Discontinuity:

Concept: Can you draw the graph without lifting your pencil off the paper?

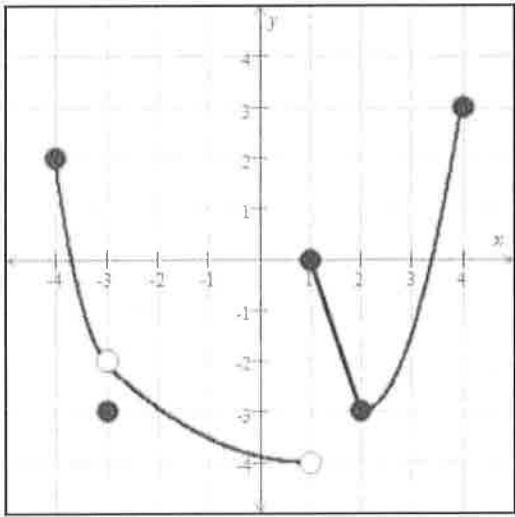
Yes => Function is continuous

No => Function is discontinuous.

Type of Discontinuity:

Infinite	Jump	Point/Hole (Removable)
<p>A function has an infinite discontinuity at $x = c$ if the function value increases or decreases indefinitely as x approaches c from the left and right.</p> <p>Example</p> 	<p>A function has a jump discontinuity at $x = c$ if the limits of the function as x approaches c from the left and right exist but have two distinct values.</p> <p>Example</p> 	<p>A function has a removable discontinuity if the function is continuous everywhere except for a hole at $x = c$.</p> <p>Example</p> 

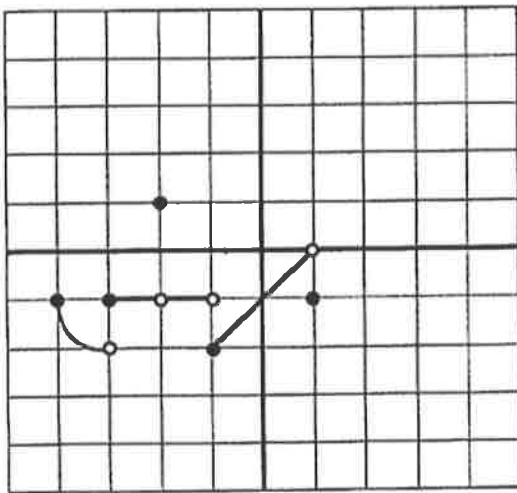
Ex 1: A function $h(x)$ is graphed below. At which values of x is h discontinuous? Describe the discontinuities.



$x = -3$ Removable / point / hole

$x = 1$ Jump

Ex 2: A function $g(x)$ is graphed below. At which values of x is g discontinuous? Describe the discontinuities.



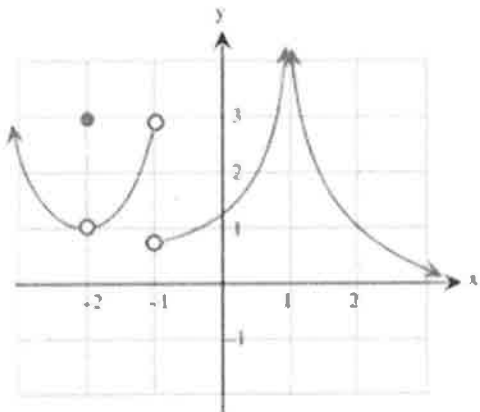
$x = -3$ Jump

$x = -2$ Removable / point / hole

$x = -1$ Jump

$x = 1$ Removable / point / hole

Ex 3: A function $f(x)$ is graphed below. At which values of x is f discontinuous? Describe the discontinuities.



$x = -2$ Removable / point / hole

$x = -1$ Jump

$x = 1$ Infinite