

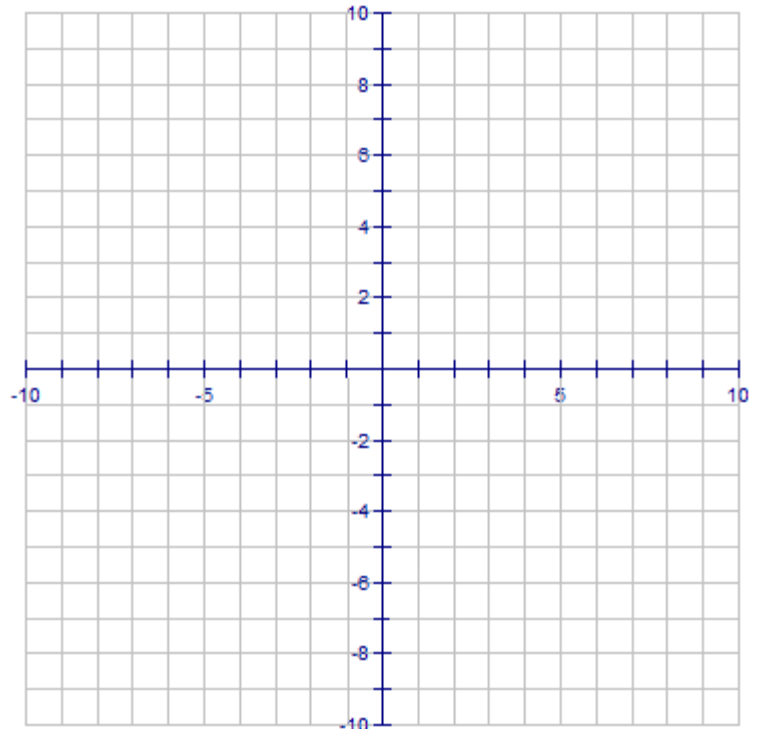
GRAPHING RATIONAL FUNCTIONS

To Identify Types of Discontinuity:

- Step 1: HOLES (Removable Discontinuities)**
- ✓ Factor numerator & denominator
 - ✓ Simplify
 - ✓ If anything cancels, then there is a hole (More than one factor cancels → More than one hole)
 - ✓ Find the ordered pair, (x, y) , substitute x into the **SIMPLIFIED EQUATION** to get y
- Step 2: VERTICAL ASYMPTOTES (USE SIMPLIFIED EQUATION)**
- ✓ Set simplified equation denominator = 0, solve for x
- Step 3: HORIZONTAL ASYMPTOTES – Two Cases (USE SIMPLIFIED EQUATION)**
- ✓ Degree of Denominator = Degree of Numerator → $y =$ ratio of leading coefficients
 - ✓ Degree of Denominator > Degree of Numerator → $y = 0$
- Step 4: SLANT ASYMPTOTES (Exists only if Horizontal Asymptote is not present) (USE SIMPLIFIED EQUATION)**
- ✓ Degree of Numerator is **ONE** degree larger than the Degree of Denominator
 - ✓ Use Long or Synthetic Division
 - ✓ Ignore the remainder
 - ✓ Answer in the form $y = mx + b$

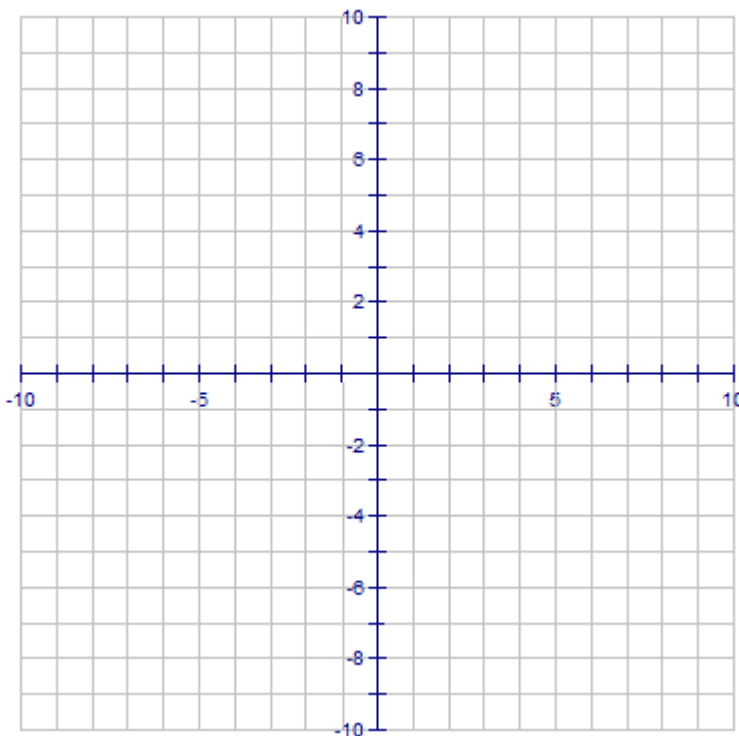
Directions: State each discontinuity, x -intercept, and y -intercept. Then sketch a graph.

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



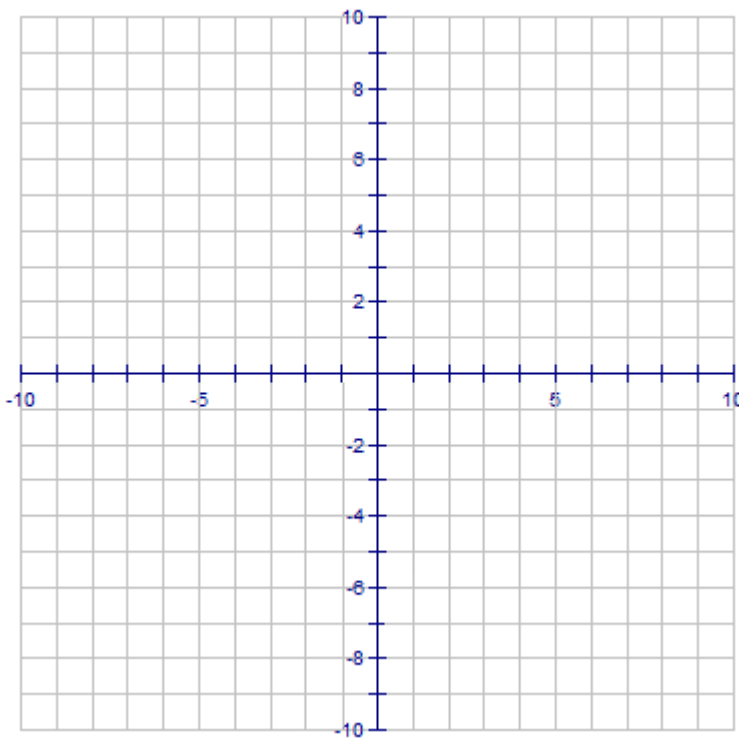
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x -intercept(s)	y -intercept

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



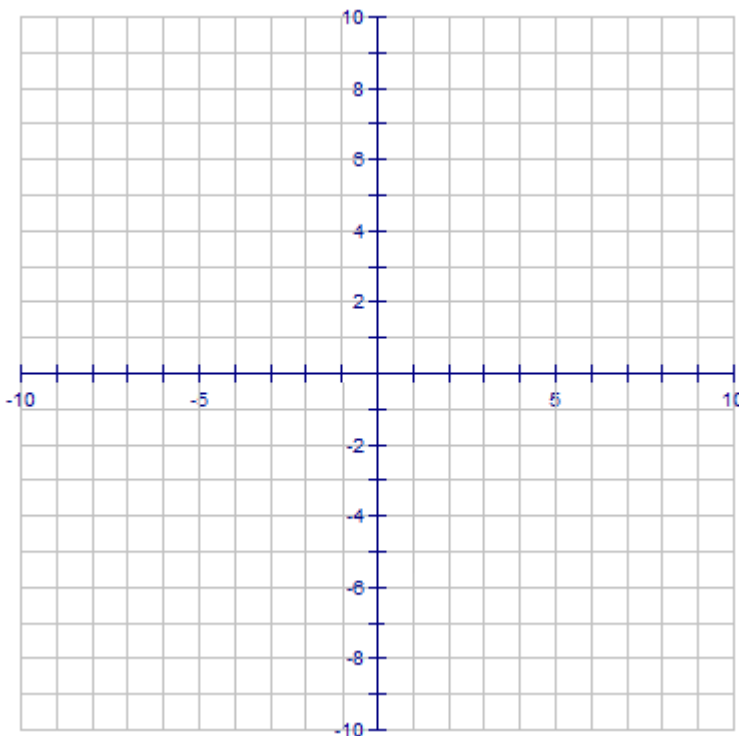
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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



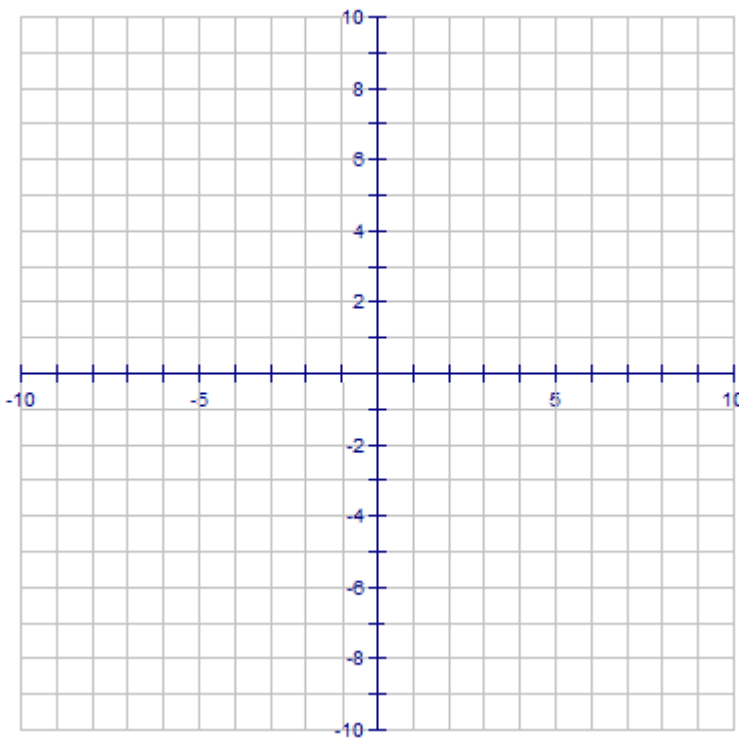
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

4.) $f(x) = \frac{x^3+4x^2-21x}{x^2+4x-21}$



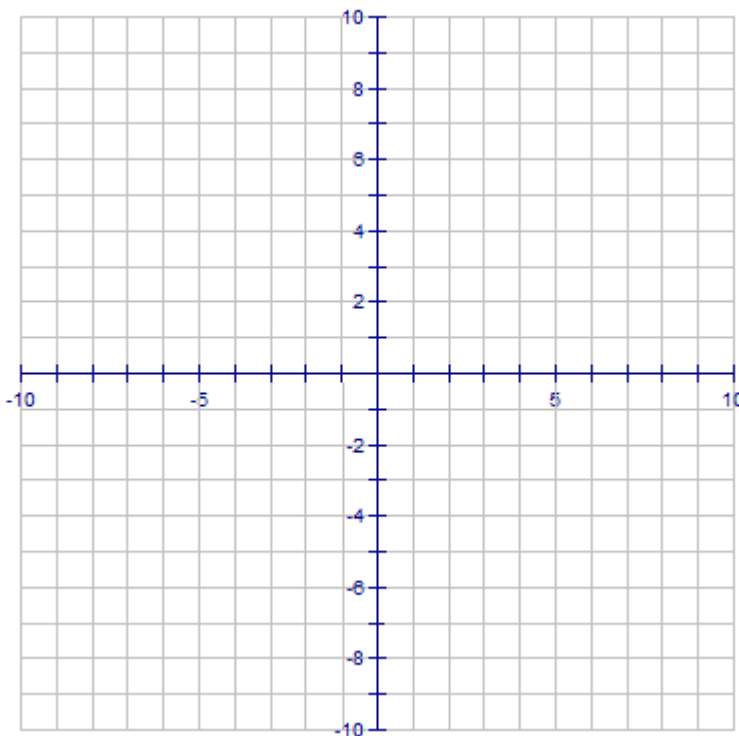
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

5.) $f(x) = \frac{x^2+5x+8}{x+3}$



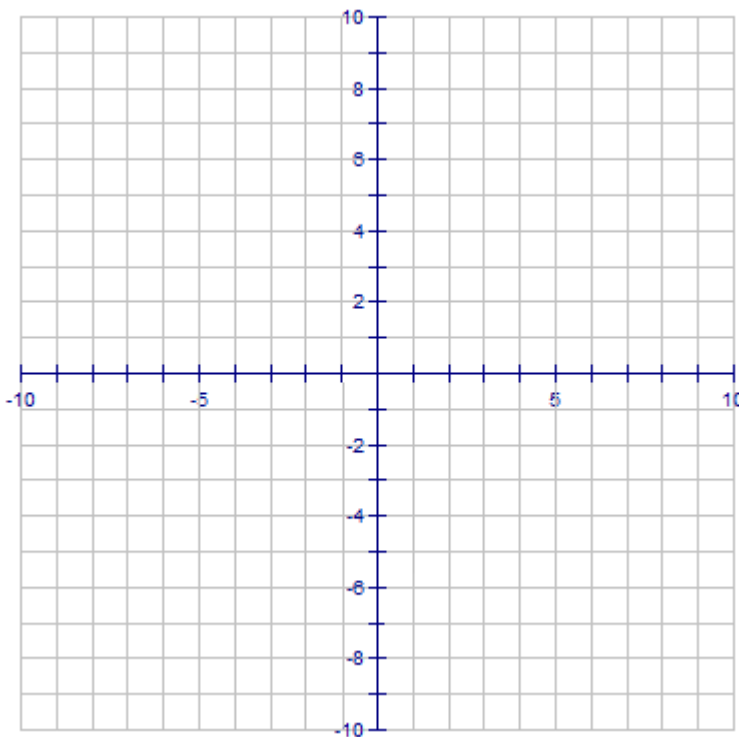
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

6.) $f(x) = \frac{x^2+x-2}{(x+2)(x^2-2x-15)}$



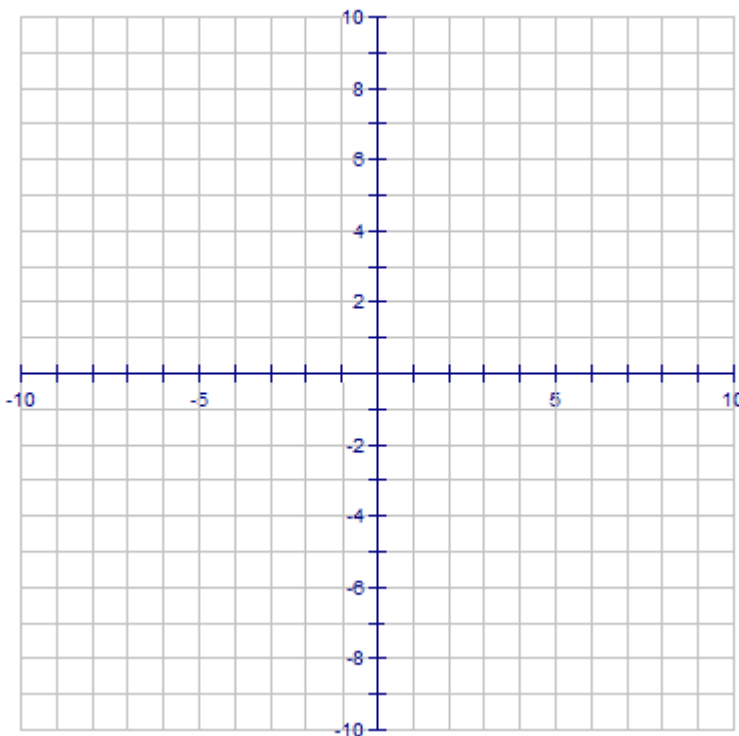
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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



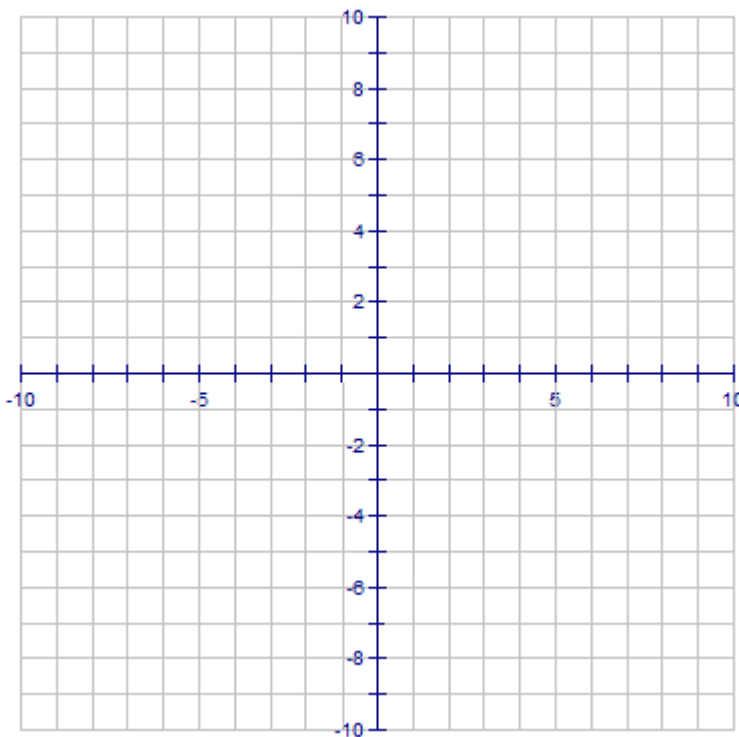
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

8.) $f(x) = \frac{3x^2}{x^2-1}$



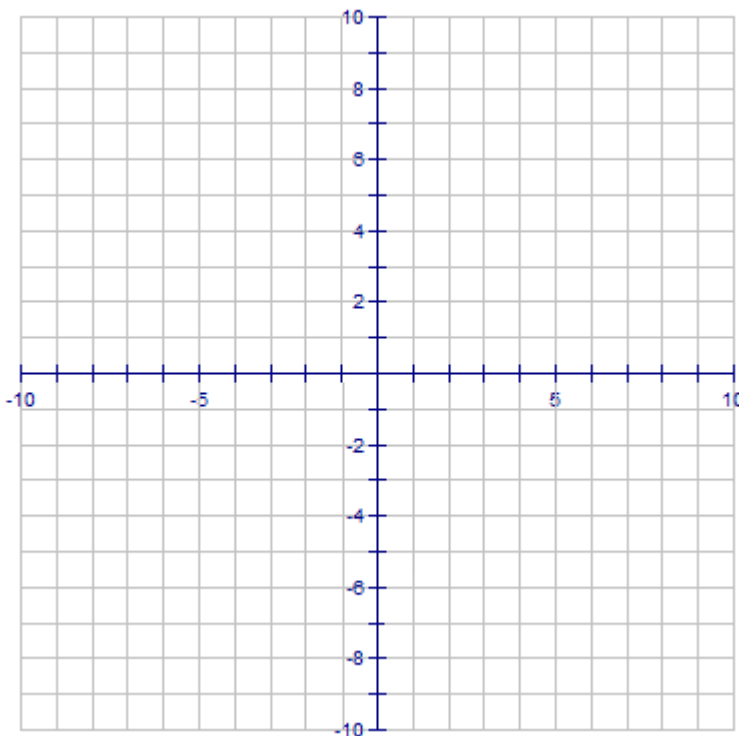
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

9.) $f(x) = \frac{x^2+7x+12}{x^2+11x+28}$



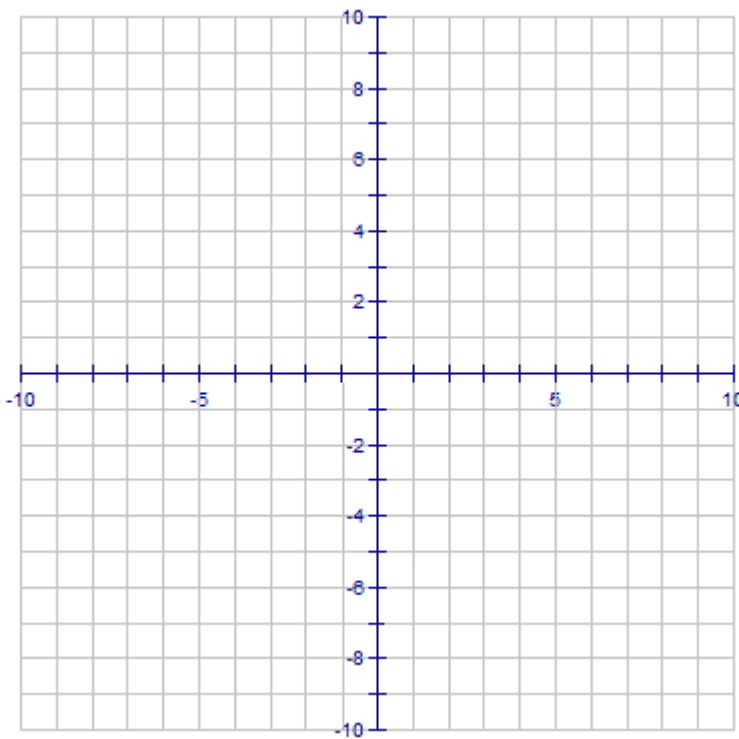
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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



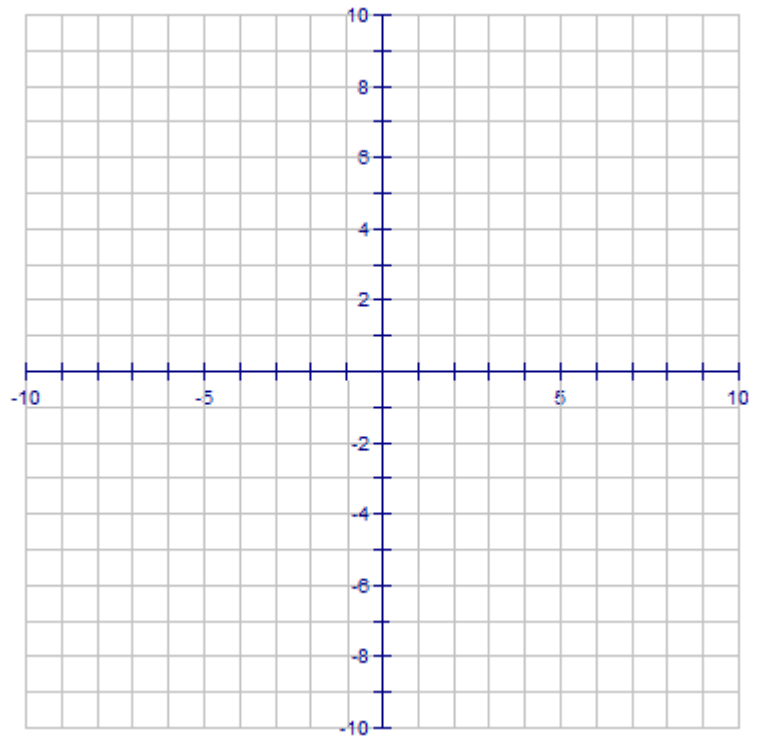
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

11.) $f(x) = \frac{x + 8}{x^2 + 5x - 24}$



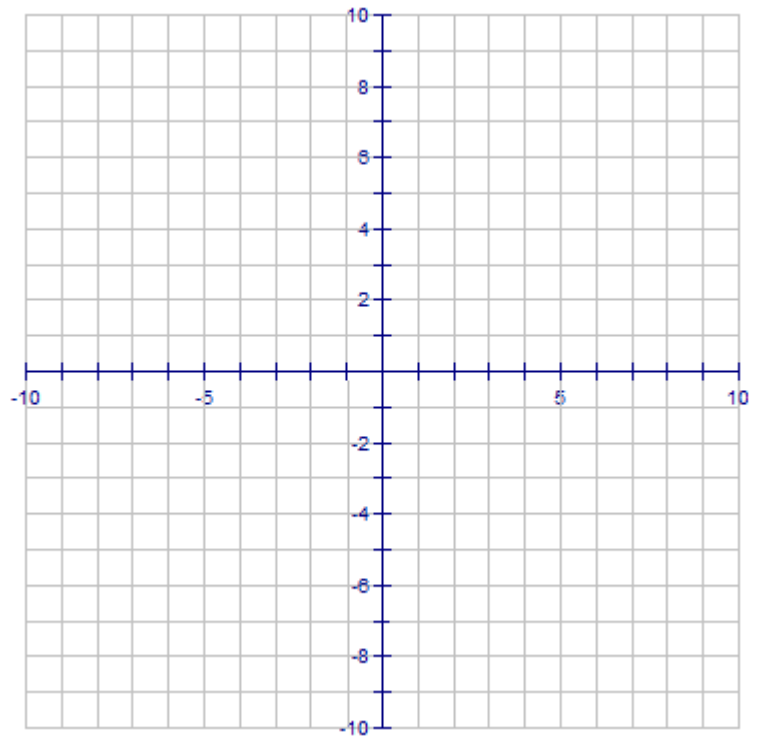
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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



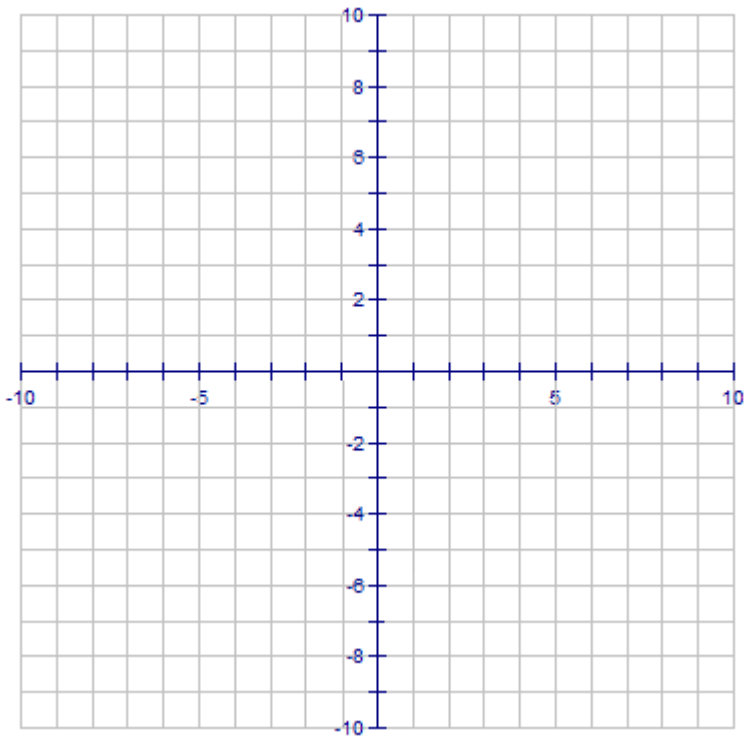
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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



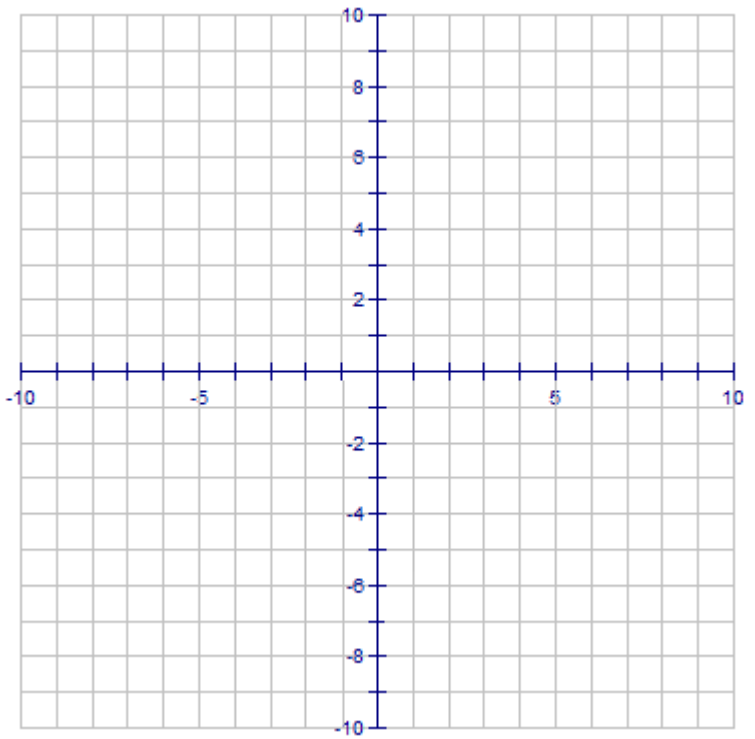
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

14.) $f(x) = \frac{x^2+x-6}{(x-2)(x^2+5x-36)}$



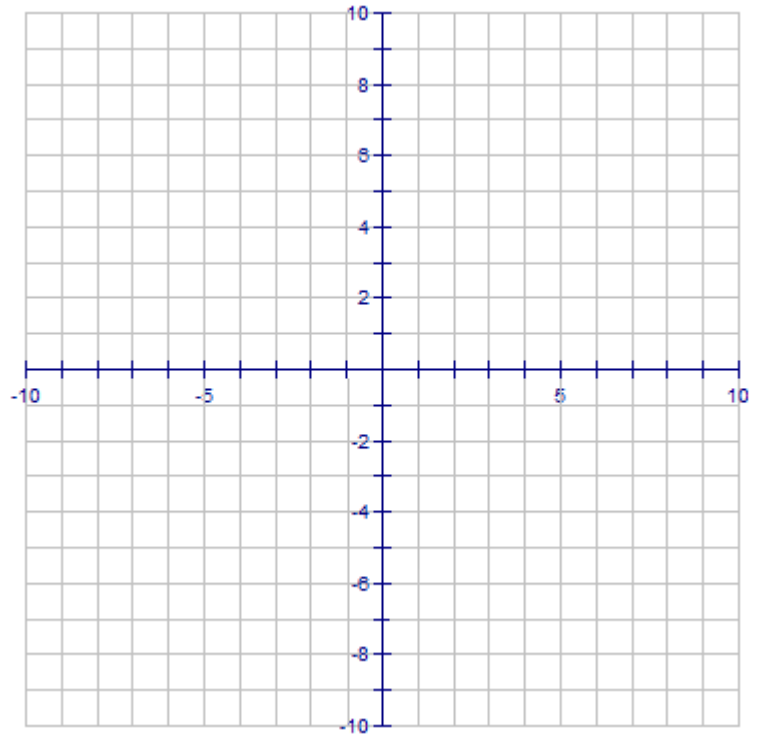
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

15.) $f(x) = \frac{x^2-6x-7}{x^2+3x-4}$



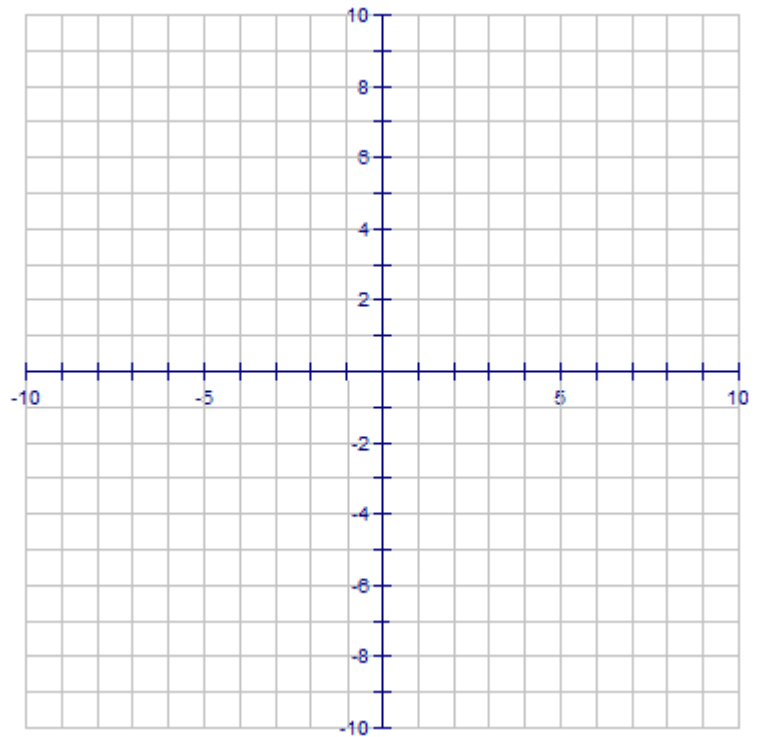
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

16.) $f(x) = \frac{2x^2}{x^2-4}$



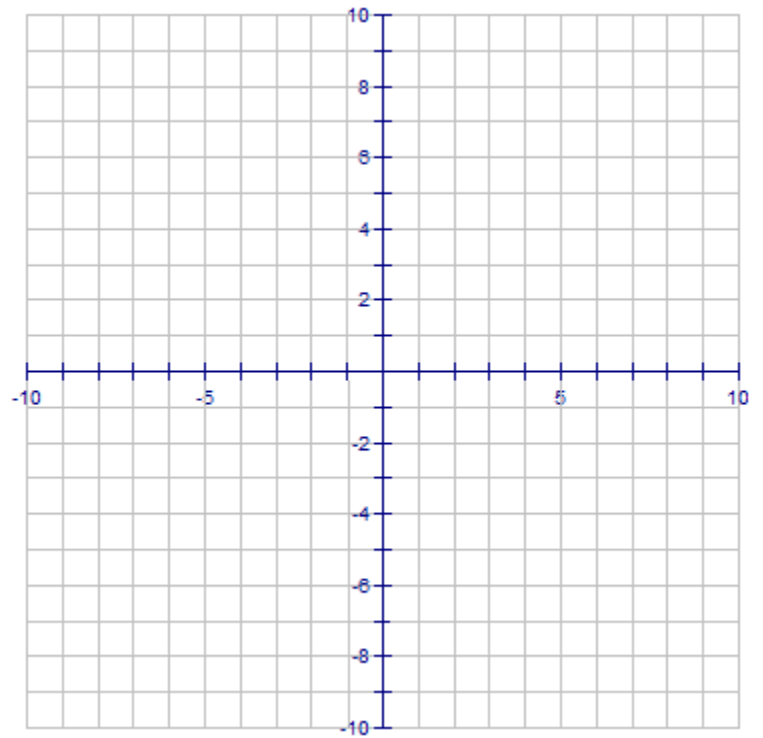
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

17.) $f(x) = \frac{x-4}{x^2+x-42}$



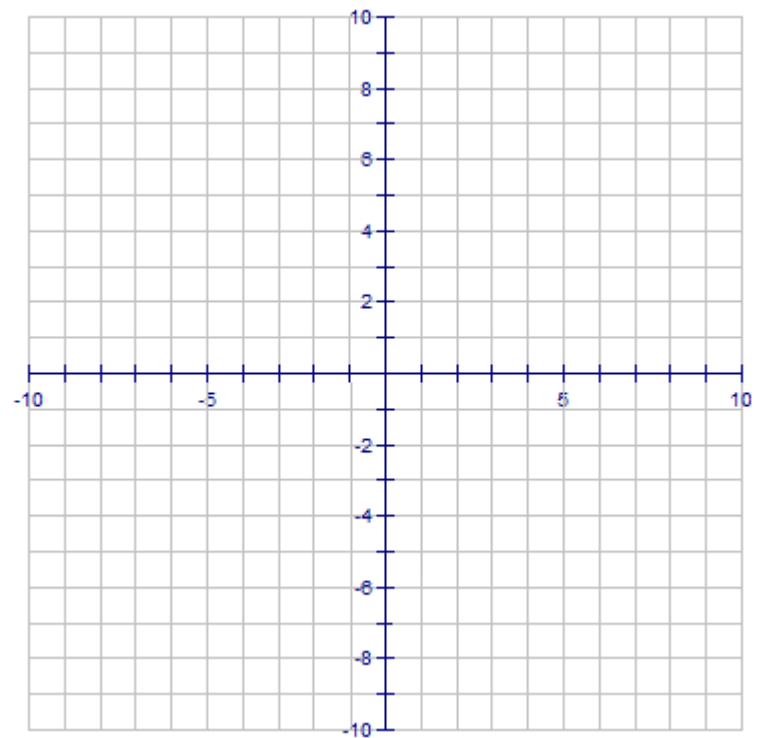
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

18.) $f(x) = \frac{x^3+3x^2-10x}{x^2+5x}$



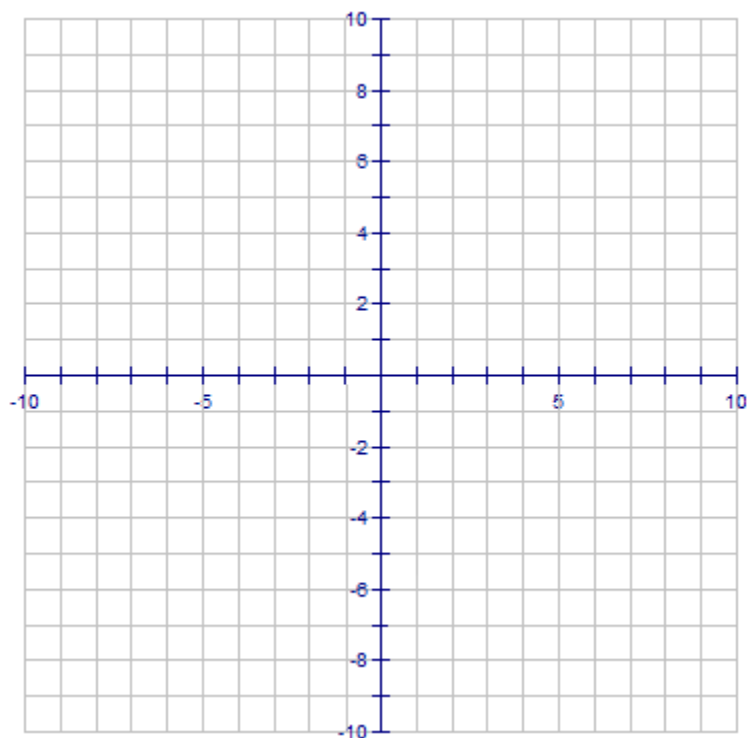
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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



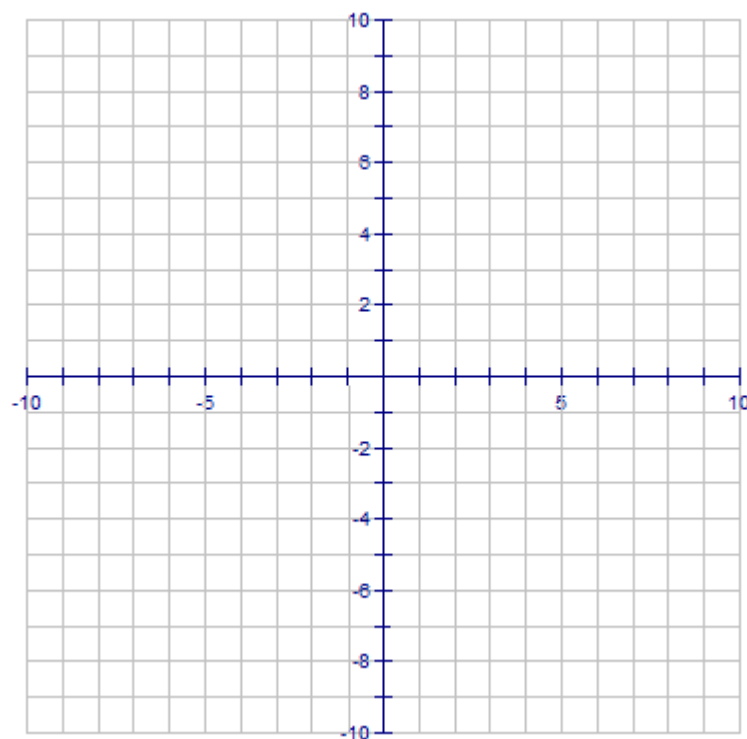
HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

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



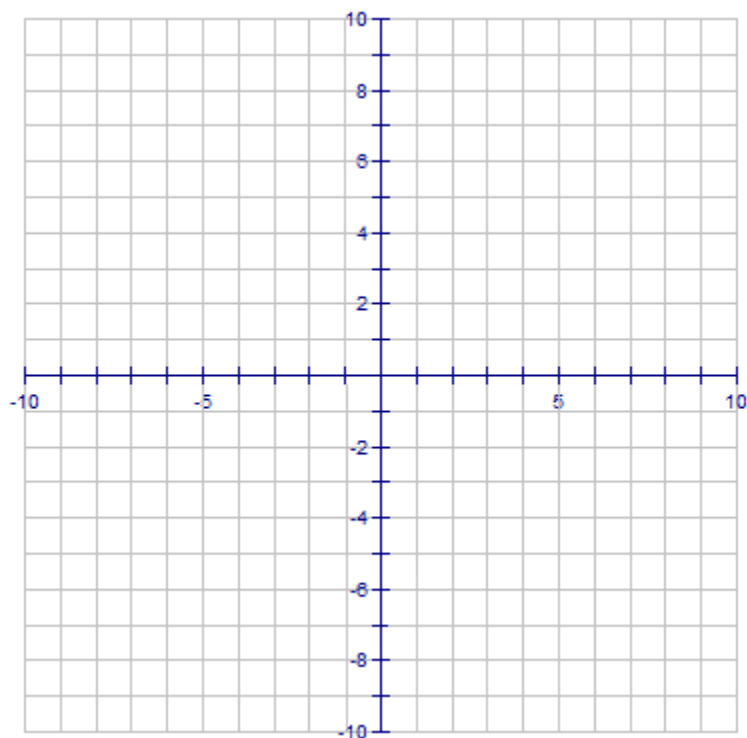
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21.) $f(x) = \frac{(x-5)(x^2-8x-9)}{x^2-8x-9}$



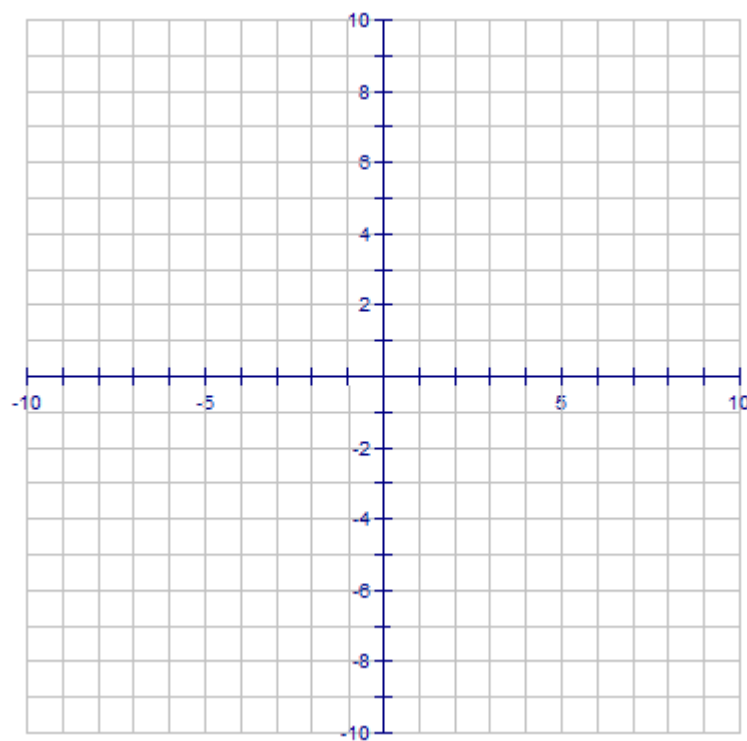
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$$22.) f(x) = \frac{2x^2 - 13x - 20}{x - 4}$$



HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	SLANT ASYMPTOTE	x-intercept(s)	y-intercept

$$23.) f(x) = \frac{2x^3 + x^2 - 8x - 4}{x^2 - 3x + 2}$$



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