

6.3 Graphing Rational Functions

PRACTICE

Directions: Find any holes or vertical asymptotes.

$$1) y = \frac{1}{x^2 - 6x - 16} = \frac{1}{(x-8)(x+2)}$$

Vert. asympt @
 $x=8$ and $x=-2$

$$2) y = \frac{2x^2 + 11x - 6}{x^2 + 2x - 24} = \frac{(2x+6)(x-1)}{(x+6)(x-4)}$$

Hole @ $x=-6$
 Vert Asym @ $x=4$

$$3) y = \frac{2x^2 - 6x}{9x - 3x^2} = \frac{2x(x-3)}{-3x(x-3)}$$

Hole @ $x=0$
 and $x=3$

Directions: Find the x- and y-intercept(s)

$$4) y = \frac{2x-3}{4x+5}$$

X-INT
 $0 = \frac{2x-3}{4x+5}$
 $0 = 2x-3$
 $3 = 2x$
 $\frac{3}{2} = x$
 $(\frac{3}{2}, 0)$

Y-INT
 $y = \frac{0-3}{0+5}$
 $y = -\frac{3}{5}$
 $(0, -\frac{3}{5})$

$$5) y = \frac{6x^2 + x - 12}{x^2 - 13x - 40} = \frac{(6x-8)(x+1.5)}{(x-16)(x+2.5)}$$

Y-INT
 $y = \frac{0+0-12}{0-0-40}$
 $y = \frac{12}{40} = \frac{3}{10}$
 $(0, \frac{3}{10})$

X-INT
 $0 = (3x-4)(x+1.5)$
 $0 = 3x-4$ or $0 = x+1.5$
 $\frac{4}{3} = x$ or $-\frac{3}{2} = x$
 $(\frac{4}{3}, 0)$ or $(-\frac{3}{2}, 0)$

$$6) y = \frac{x^2 + x - 30}{x^2 - 8x + 15} = \frac{(x+6)(x-5)}{(x-5)(x-3)}$$

Y-INT
 $y = \frac{0+0-30}{0-0+15}$
 $y = -2$
 $(0, -2)$

X-INT
 $0 = \frac{x+6}{x-3}$
 $0 = x+6$
 $-6 = x$
 $(-6, 0)$

Directions: Find any horizontal asymptotes.

$$7) y = \frac{4x^3 + 7x - 12}{2x - 7}$$

NO Horiz.
 Asym.

$$8) y = \frac{8x-3}{2x+9}$$

$y = \frac{8}{2}$
 $y = 4$

$$9) y = \frac{3x^2 - 4x + 9}{4x^3 + 8x^2 - 10x + 1}$$

$y = 0$

Directions: Find the slant asymptote (if it exists).

$$10) y = \frac{6x^3 + 8x^2 - 7x}{2x^2 - 3x + 1}$$

$3x + 8.5$

$$\begin{array}{r} 2x^2 - 3x + 1 \overline{) 6x^3 + 8x^2 - 7x + 0} \\ \underline{6x^3 - 9x^2 + 3x} \\ 17x^2 - 10x + 0 \\ \underline{17x^2 - 25.5x + 18.5} \\ 15.5x + 18.5 \end{array}$$

$y = 3x + 8.5$

$$11) y = \frac{2x^2 + 11x - 6}{x^2 + 2x - 24}$$

NO
 SLANT
 Asymp

$$12) y = \frac{x^2 + 6x - 10}{2x - 4}$$

$\frac{1}{2}x + 4$

$$\begin{array}{r} 2x - 4 \overline{) x^2 + 6x - 10} \\ \underline{x^2 - 2x} \\ 8x - 10 \\ \underline{8x - 16} \\ 6 \end{array}$$

$y = \frac{1}{2}x + 4$

Directions: Find the information need and sketch. Include all relevant information on your graph.

13) $y = \frac{9}{x^2+1}$

Hole/Vertical Asymptotes:
NONE

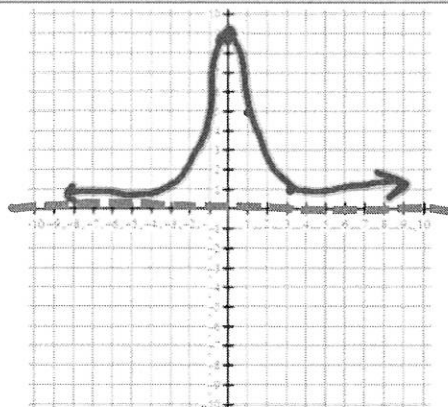
Y-int: $y = \frac{9}{0+1}$

$y = 9$ (0, 9)

X-int: $0 = \frac{9}{x^2+1}$

$0 = 9$ NONE

Horizontal/Slant Asymptote:
 $y = 0$



14) $y = \frac{x^3-x^2-20x}{x^2-2x-3} = \frac{x(x-5)(x+4)}{(x-3)(x+1)}$

Hole/Vertical Asymptotes:
Vert Asym @ $x=3$ and $x=-1$

Y-int: $y = \frac{0-0-0}{0-0-3}$

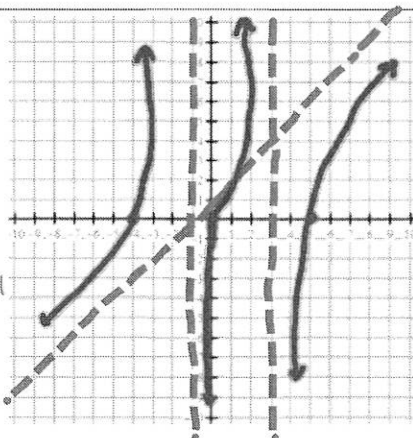
$y = 0$

X-int: $0 = \frac{x(x-5)(x+4)}{(x-3)(x+1)}$

$0 = x(x-5)(x+4)$

$0 = x \quad x=5 \quad x=-4$

Horizontal/Slant Asymptote: $\frac{x+4}{x^2-2x-3}$
 $\frac{x^3-x^2-20x}{x^2-2x-3} = \frac{x^3-x^2-3x}{x^2-2x-3} + \frac{17x+10}{x^2-2x-3}$
 $\frac{x^2-17x+10}{x^2-2x-3}$



15) $y = \frac{2x+8}{x^2-2x-24} = \frac{2(x+4)}{(x-6)(x+4)}$

Hole/Vertical Asymptotes:

hole: $x = -4$

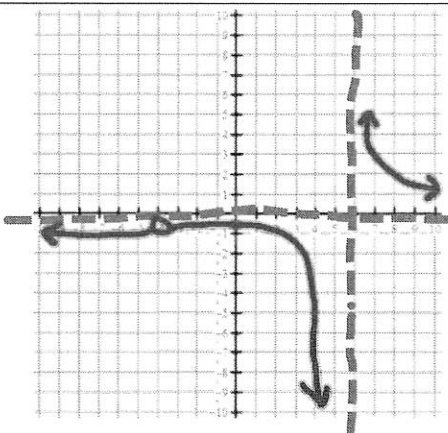
Vert Asym: $x = 6$

Y-int: $y = \frac{0+8}{0-0-24} = -\frac{1}{3}$
(0, -1/3)

X-int: $0 = \frac{2}{x-6}$

$0 = 2$ NONE

Horizontal/Slant Asymptote:
 $y = 0$



16) $y = \frac{x-2}{x^2-2x-3} = \frac{x-2}{(x-3)(x+1)}$

Hole/Vertical Asymptotes:

Vert Asym: $x=3$
 $x=-1$

Y-int: $\frac{0-2}{0-0-3} = \frac{2}{3}$

(0, 2/3)

X-int: $0 = \frac{x-2}{x^2-2x-3}$

$0 = x-2$

$2 = x$ (2, 0)

Horizontal/Slant Asymptote:
 $y = 0$

