

① Factor: $-x^2 - 3x - 18 = (x - 6)(x + 3)$

DRILL
 $\frac{+}{+}$
 ADD ← ← MULT

② Find horizontal asymptote of: $f(x) = \frac{4x^2 - 3}{8x^2 + 5}$

HA @ $y = \frac{4}{8} \Rightarrow y = \frac{1}{2}$

③ Find the vertical asymptote(s) of:

$f(x) = \frac{8}{x^2 + 4x - 12}$

VA @ $x^2 + 4x - 12 = 0$

MULT
 ADD ←

$(x - 2)(x + 6) = 0$

$x - 2 = 0$ $x + 6 = 0$

VA @ $x = 2$ or $x = -6$

Solving Rational Equations

Review: Cross Product

If $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$

Ex:

SOLVE:

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

$$2(x+2) = 3(x-4)$$

* Check:

$$\frac{16+2}{3} = \frac{16-4}{2}$$
$$\frac{18}{3} = \frac{12}{2}$$
$$6 = 6 \checkmark$$

$$\cancel{2x} + 4 = \cancel{3x} - 12$$
$$4 = x - 12$$
$$+12 \quad +12$$

$$\boxed{16 = x} \text{ SOLUTION}$$

Ex:

$$\frac{2x-3}{4} = \frac{3x+2}{8}$$

$$8(2x-3) = 4(3x+2)$$
$$16x - 24 = \cancel{12x} + 8$$

Check:

$$\frac{2(8)-3}{4} = \frac{3(8)+2}{8}$$

$$4x - \cancel{24} = 8$$
$$+24 \quad +24$$

$$\frac{4x}{4} = \frac{32}{4}$$

$$\frac{13}{4} = \frac{\cancel{26}^{13}}{\cancel{8}_4} \quad \checkmark$$

$$\boxed{x = 8} \quad \checkmark$$

$$3.25 = 3.25 \quad \checkmark$$

$$\frac{6x}{6} = \frac{42}{63}$$
$$x = \frac{2}{3}$$

Ex:

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

$$(x+3)(x+5) = (x-2)(x+4)$$

$$x^2 + 5x + 3x + 15 = x^2 + 4x - 2x - 8$$

$$x^2 + 8x + 15 = x^2 + 2x - 8$$

$$8x + 15 = 2x - 8$$

$$6x + 15 = -8$$

$$6x = -23$$

$$x = -\frac{23}{6}$$

Ex:

$$\frac{x-12}{x+2} = \frac{x+3}{-2}$$

$$(x+2)(x+3) = -2(x-12)$$

$$x^2 + 3x + 2x + 6 = -2x + 24$$

$$x^2 + 5x + 6 = -2x + 24$$

$$x^2 + 7x - 18 = 0$$

$$(x+9)(x-2) = 0$$

$$x+9=0$$
$$-9-9$$

$$x = -9$$

$$x-2=0$$
$$+2+2$$

$$x = 2$$

* SOLUTIONS *

Hole when the numerator & denominator have the same factor.

$$f(x) = \frac{(x+5)}{(x+5)}$$

HA

$$\text{DEG}(\text{NUM}) < \text{DEG}(\text{DENOM})$$

$$Y = 0$$

$$\text{DEG}(\text{NUM}) = \text{DEG}(\text{DENOM})$$

$$Y = \frac{a}{b}$$

$$\frac{ax^2 + c}{bx^2 + d}$$