

LESSON 172

1. $\frac{x^2 + x - 2}{x^2 + 3x + 2} = \frac{(x-1)(x+2)}{(x+1)(x+2)} = \frac{x-1}{x+1}$
 for $x \neq -1, -2$

2. $\frac{x^2 + 4x - 5}{x^2 + 5x} \cdot \frac{x^2}{x^2 - 1}$
 $= \frac{(x-1)(x+5)}{x(x+5)} \cdot \frac{x^2}{(x+1)(x-1)}$
 $= \frac{x}{x+1}$ for $x \neq 0, -5, -1, 1$

3. $\frac{x^2 + 6x + 8}{x^2 + 2x} \div (x+4)$
 $= \frac{x^2 + 6x + 8}{x^2 + 2x} \cdot \frac{1}{x+4} = \frac{(x+2)(x+4)}{x(x+2)} \cdot \frac{1}{x+4}$
 $= \frac{1}{x}$ for $x \neq 0, -2, -4$

4. $\frac{x^2 - 9x}{x^2 + 2x - 3} + \frac{9}{x+3} = \frac{x^2 - 9x}{(x-1)(x+3)} + \frac{9}{x+3}$
 $= \frac{x^2 - 9x}{(x-1)(x+3)} + \frac{9(x-1)}{(x+3)(x-1)}$
 $= \frac{x^2 - 9}{(x-1)(x+3)} = \frac{(x+3)(x-3)}{(x-1)(x+3)}$
 $= \frac{x-3}{x-1}$ for $x \neq 1, -3$

5. $\frac{\frac{2}{3} + \frac{1}{6}}{\frac{5}{9} + \frac{1}{3}} = \frac{18(\frac{2}{3} + \frac{1}{6})}{18(\frac{5}{9} + \frac{1}{3})} = \frac{12 + 3}{10 + 6} = \frac{15}{16}$

6. $\frac{2}{\frac{1}{x} - \frac{1}{x+2}} = \frac{x(x+2)(2)}{x(x+2)(\frac{1}{x} - \frac{1}{x+2})}$
 $= \frac{2x(x+2)}{x+2-x} = \frac{2x(x+2)}{2}$
 $= x(x+2)$ for $x \neq 0, -2$

7. $\frac{1}{x-5} = \frac{3}{x-3}$ Restrictions: $x \neq 5, 3$
 LCD = $(x-5)(x-3)$
 $x-3 = 3(x-5)$ Multiply both sides by the
 $x = 6$ LCD, then solve for x .

8. $\frac{5}{x} + \frac{x}{x-8} = \frac{1}{x}$ Restrictions: $x \neq 0, 8$
 LCD = $x(x-8)$
 $5(x-8) + x^2 = x-8$ Multiply both sides by the
 $x^2 + 4x - 32 = 0$ LCD, then solve for x .
 $(x-4)(x+8) = 0$
 $x = 4, x = -8$

9. $\frac{x+1}{x} + \frac{x}{2} = \frac{1}{x}$ Restrictions: $x \neq 0$
 LCD = $2x$
 $2(x+1) + x^2 = 2$ Multiply both sides by the
 $x^2 + 2x = 0$ LCD, then solve for x .
 $x(x+2) = 0$
 $x = 0, x = -2$
 $x \neq 0$, so $x = -2$. $x = 0$ is extraneous.

10. $\frac{1}{x} - \frac{1}{x+1} = \frac{2}{x^2+x}$
 $\frac{1}{x} - \frac{1}{x+1} = \frac{2}{x(x+1)}$ Restrictions: $x \neq 0, -1$
 LCD = $x(x+1)$
 $x+1-x = 2$ Multiply both sides by the
 $1 = 2$ LCD, then solve for x .
 No solutions

11. The answer is D.
 $\frac{x-2}{x} - \frac{x-4}{2x} = \frac{1}{2}$ Restrictions: $x \neq 0$
 LCD = $2x$
 $2(x-2) - (x-4) = x$ Multiply both sides by the
 $0 = 0$ LCD, then solve for x .
 All x except 0

12. The vertical asymptote is $x = 3$ because it is the value of x that makes the denominator zero.
 The horizontal asymptote is $y = 4/1 = 4$ because it is the ratio of the leading coefficients of the numerator and denominator when their degrees are equal.

13. The answer is D.
 $(1, 0)$ is on the graph, so eliminate A and C.
 The vertical asymptote is $x = 2$, so choose D.

14. The answer is B.
 $(2, 0)$ is on the graph, so eliminate A and D.
 The horizontal asymptote is $y = 1$, so choose B.

15. The answer is C.

$$y = \frac{1}{x} \quad \text{Parent function}$$

$$y = -\frac{1}{x} \quad \text{Reflect over the } x\text{-axis.}$$

$$y = -\frac{1}{x+4} \quad \text{Shift left 4 units.}$$

$$f(x) = -\frac{1}{x+4} - 5 \quad \text{Shift down 5 units.}$$

16. x = time to drain the pool together

Pipe A's rate + Pipe B's rate = combined rate, so

$$\frac{1}{3} + \frac{1}{6} = \frac{1}{x}$$

Solve for x , and you get $x = 2$.

It will take 2 hours.

17. x = speed of the wind

$150 + x$ = speed of the plane with the wind

$150 - x$ = speed of the plane against the wind

Time with the wind = time against the wind, so

$$\frac{800}{150+x} = \frac{700}{150-x}$$

Solve for x , and you get $x = 10$.

The speed of the wind is 10 mph.

18. x = shadow length, y = object height

Plug $x = 12$ and $y = 8$ into $y = kx$.

$$8 = 12k; k = 2/3$$

The equation is $y = (2/3)x$.

When $x = 30$, $y = 20$.

The tree is 20 feet tall.