

PRACTICE TEST, pages 610–612

1. Multiple Choice What are the non-permissible values of x for

$$\frac{x^2 - 3x}{x^2 + 8x - 33}?$$

- A. $-11, 0$ B. $-3, 0, 11$ C. -11 **D. $-11, 3$**

2. Multiple Choice Which is the correct simplification of $\frac{x^2 - 4}{x^2 + 4x + 4}$?

- A. $\frac{x - 2}{x + 2}, x \neq -2$** B. $\frac{x - 2}{x + 2}, x \neq -2, 2$
 C. $\frac{-1}{x + 1}, x \neq -1$ D. $\frac{-1}{4x}, x \neq 0$

3. Simplify.

$$\begin{aligned} \text{a) } \frac{p^2 - 9}{18} \cdot \frac{12p}{3 - p} \\ &= \frac{\cancel{(p-3)}(p+3)}{3 \cdot \cancel{18}} \cdot \frac{2 \cdot \cancel{12} p}{-\cancel{(p-3)}} \\ &= \frac{2p(p+3)}{-3} \\ &= \frac{-2p(p+3)}{3}, p \neq 3 \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{2b^2 - 3b + 1}{b^2 - b} \div \frac{6b - 3}{b^2} \\ &= \frac{(2b-1)(b-1)}{b(b-1)} \div \frac{3(2b-1)}{b^2} \\ &= \frac{\cancel{(2b-1)} \cdot \cancel{(b-1)}}{b \cdot \cancel{(b-1)}} \cdot \frac{b^2}{3 \cdot \cancel{(2b-1)}} \\ &= \frac{b}{3}, b \neq 0, \frac{1}{2}, 1 \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{8a}{5bc^2} \div \frac{20ab}{15c} \cdot \frac{2b}{3} \\ &= \frac{\cancel{4} \cdot \cancel{8} a}{5bc^2} \cdot \frac{\cancel{3} \cdot \cancel{15} c}{\cancel{5} \cdot \cancel{10} \cdot \cancel{20} ab} \cdot \frac{2b}{\cancel{3}} \\ &= \frac{4}{5bc}, a \neq 0, b \neq 0, c \neq 0 \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{5x}{8} + \frac{3}{20x} \\ \text{Common denominator: } 80x \\ &= \frac{5x}{8} \cdot \frac{10x}{10x} + \frac{3}{20x} \cdot \frac{4}{4} \\ &= \frac{50x^2}{80x} + \frac{12}{80x} \\ &= \frac{50x^2 + 12}{80x} \\ &= \frac{2(25x^2 + 6)}{80x} \\ &= \frac{25x^2 + 6}{40x}, x \neq 0 \end{aligned}$$

$$\text{e) } \frac{x+1}{5x+10} - \frac{3}{8-4x}$$

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

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

Common denominator:

$$20(x-2)(x+2)$$

$$= \frac{(x+1)}{5(x+2)} \cdot \frac{4(x-2)}{4(x-2)}$$

$$+ \frac{3}{4(x-2)} \cdot \frac{5(x+2)}{5(x+2)}$$

$$= \frac{(x+1)(4x-8)}{20(x+2)(x-2)}$$

$$+ \frac{15(x+2)}{20(x+2)(x-2)}$$

$$= \frac{4x^2 - 4x - 8 + 15x + 30}{20(x+2)(x-2)}$$

$$= \frac{4x^2 + 11x + 22}{20(x+2)(x-2)}, x \neq -2, 2$$

$$\text{f) } \frac{n}{n^2-16} - \frac{n+1}{n^2+5n+4}$$

$$= \frac{n}{(n-4)(n+4)} - \frac{\cancel{n+1}}{(n+4)\cancel{(n+1)}}$$

$$= \frac{n}{(n-4)(n+4)} - \frac{1}{n+4}$$

Common denominator:

$$(n-4)(n+4)$$

$$= \frac{n}{(n-4)(n+4)} - \frac{1}{(n+4)} \cdot \frac{(n-4)}{(n-4)}$$

$$= \frac{n}{(n-4)(n+4)} - \frac{n-4}{(n-4)(n+4)}$$

$$= \frac{4}{(n-4)(n+4)}, n \neq -4, -1, 4$$

4. Solve each equation.

$$\text{a) } \frac{a}{a-5} + 3 = \frac{5}{a-5}$$

Non-permissible value: $a = 5$

Common denominator: $a - 5$

$$\frac{a}{a-5} + 3 = \frac{5}{a-5}$$

$$3 = \frac{5}{a-5} - \frac{a}{a-5}$$

$$3 = \frac{5-a}{a-5}$$

$$(a-5)(3) = \cancel{(a-5)} \left(\frac{5-a}{\cancel{a-5}} \right)$$

$$3a - 15 = 5 - a$$

$$4a = 20$$

$$a = 5$$

$a = 5$ is a non-permissible value.

So, the equation has no solution.

$$\text{b) } \frac{2b+1}{b-1} - \frac{3b}{b+2} = \frac{18}{b^2+b-2}$$

$$\frac{2b+1}{b-1} - \frac{3b}{b+2} = \frac{18}{(b+2)(b-1)}$$

Non-permissible values: $b = 1$ and $b = -2$

Common denominator: $(b+2)(b-1)$

$$(b+2)\cancel{(b-1)}\left(\frac{2b+1}{\cancel{b-1}}\right) - \cancel{(b+2)}(b-1)\left(\frac{3b}{\cancel{b+2}}\right) = \cancel{(b+2)}\cancel{(b-1)}\left(\frac{18}{(b+2)(b-1)}\right)$$

$$2b^2 + 5b + 2 - (3b^2 - 3b) = 18$$

$$2b^2 + 5b + 2 - 3b^2 + 3b = 18$$

$$-b^2 + 8b - 16 = 0$$

$$b^2 - 8b + 16 = 0$$

$$(b-4)^2 = 0$$

$$b = 4$$

5. Pump A can drain a pond in 8 h. Working together, Pumps A and B can drain the same pond in 5 h. How long would it take Pump B to drain the pond on its own?

Let t hours represent the time it takes Pump B to drain the pond on its own. After 5 h, Pump A has drained $\frac{5}{8}$ of the pond and Pump B has drained $\frac{5}{t}$ of the pond.

So, an equation is: $\frac{5}{8} + \frac{5}{t} = 1, t > 0$

Non-permissible value: $t = 0$

Common denominator: $8t$

$$\frac{5}{8} + \frac{5}{t} = 1$$

$$8t\left(\frac{5}{8}\right) + 8t\left(\frac{5}{t}\right) = 8t(1)$$

$$5t + 40 = 8t$$

$$3t = 40$$

$$t = \frac{40}{3}$$

It would take Pump B $\frac{40}{3}$ h, or $13\frac{1}{3}$ h, or 13 h 20 min to drain the pond on its own.