

Name: Solutions

Find any numbers for which the rational expression is undefined.

1) $\frac{x^3+7x^4}{x^2+64}$

1) _____

$x^2+64 \geq 0$ for any choice
of x so this
is never undefined

2) $\frac{x^2-25}{x^2-6x+8}$

2) _____

$x^2-6x+8=0$
 $(x-4)(x-2)=0$
 $x=4$ or $x=2$

undefined when
 $x=4$ or 2

Simplify the expression.

3) $\frac{9-m}{m-9}$

3) _____

↓
opposites

$\frac{9-m}{m-9} = \frac{-(m-9)}{m-9} = \boxed{-1}$

$$4) \frac{x^2-81}{x^2-5x+6} = \frac{(x+9)(x-9)}{(x+3)(x-2)}$$

4) _____

Factors of 6	Sum to -5
-3, -2	-5 ✓

$$5) \frac{a^2-ab+7a-7b}{a+7}$$

5) _____

$$\frac{a(a-b)+7(a-b)}{a+7} = \frac{\cancel{(a+7)}(a-b)}{\cancel{(a+7)}} = \boxed{a-b}$$

Find the product and simplify.

$$6) \frac{2p-2}{p} \cdot \frac{5p^2}{6p-6}$$

6) _____

$$\frac{\cancel{2}(p-1)}{\cancel{p}} \cdot \frac{5p^{\cancel{2}}}{\cancel{6}(p-1) \cdot 3} = \boxed{\frac{5p}{3}}$$

$$7) \frac{x^2 - 20x + 99}{x^2 - 5x + 4} \cdot \frac{x^2 - 14x + 40}{x^2 - 12x + 27}$$

7) _____

$$= \frac{(x-11)(x-9)}{(x-4)(x-1)} \cdot \frac{(x-4)(x-10)}{(x-9)(x-3)}$$

$$\boxed{\frac{(x-11)(x-10)}{(x-1)(x-3)}}$$

Find the quotient and simplify.

$$8) \frac{99x^9}{x^2-1} \div \frac{x^{11}}{(x+1)^2}$$

8) _____

$$\frac{99x^9}{x^2-1} \cdot \frac{(x+1)^2}{x^{11}} = \frac{99x^9}{(x+1)(x-1)} \cdot \frac{(x+1)(x+1)}{x^{11}}$$

$$\boxed{\frac{99(x+1)}{x(x-1)}}$$

$$9) \frac{x+1}{-3-x} \div \frac{x^2+8x-9}{x^2+2x-3}$$

9) _____

$$\frac{x+1}{-3-x} \cdot \frac{x^2+2x-3}{x^2+8x-9}$$

$$= \frac{x+1}{-(x+3)} \cdot \frac{(x+3)(x-1)}{(x+9)(x-1)}$$

$$= \frac{(x+1)}{-(x+9)}$$

OR $-\frac{(x+1)}{x+9}$

Perform the indicated operation. Simplify if possible.

10) $\frac{5x}{x-5} - \frac{25}{x-5}$

10) _____

$$\frac{5x-25}{x-5} = \frac{5(\cancel{x-5})}{(\cancel{x-5})} = \boxed{5}$$

11) $\frac{8}{x+7} + \frac{2}{7x+49}$

11) _____

* $\frac{8}{x+7} + \frac{2}{7(x+7)}$ LCD = $7(x+7)$

$$\frac{7 \cdot 8}{7(x+7)} + \frac{2}{7(x+7)} = \frac{56+2}{7(x+7)} = \frac{58}{7(x+7)}$$

12) $\frac{x-3}{x^2+4x-32} + \frac{3x+4}{x^2+7x-8}$

12) _____

* $\frac{x-3}{(x+8)(x-4)} + \frac{3x+4}{(x+8)(x-1)}$

LCD = $(x+8)(x-4)(x-1)$

$$= \frac{(x-3)(x-1)}{(x+8)(x-4)(x-1)} + \frac{(3x+4)(x-4)}{(x+8)(x-4)(x-1)}$$

$$= \frac{x^2 - x - 3x + 3 + 3x^2 - 12x - 4x + 16}{(x+8)(x-4)(x-1)}$$

$$\boxed{\frac{4x^2 - 20x + 19}{(x+8)(x-4)(x-1)}}$$

Solve the equation.

$$13) \frac{x}{6} + \frac{7}{3} = \frac{x-8}{3}$$

13) _____

$$\text{LCD} = 6$$

$$6\left(\frac{x}{6}\right) + 6\left(\frac{7}{3}\right) = 6\left(\frac{x-8}{3}\right)$$

$$x + 2 \cdot 7 = 2(x-8)$$

$$x + 14 = 2x - 16$$

$$14 + 16 = 2x - x$$

$$\boxed{30 = x}$$

$$14) \frac{1}{x+7} + \frac{2}{x+3} = \frac{-4}{x^2+10x+21} \rightarrow \frac{1}{x+7} + \frac{2}{x+3} = \frac{-4}{(x+7)(x+3)}$$

14) _____

$$\text{LCD} = (x+7)(x+3)$$

$$(x+7)(x+3)\left(\frac{1}{x+7}\right) + (x+7)(x+3)\left(\frac{2}{x+3}\right) = \frac{-4}{(x+7)(x+3)}(x+7)(x+3)$$

$$= (x+3) + 2(x+7) = -4$$

$$= x+3 + 2x+14 = -4$$

$$3x = -21$$

$$\boxed{x = -7}$$

Solve the equation for the indicated variable.

$$15) P = \frac{A}{1+rt} \text{ for } r$$

15) _____

$$P(1+rt) = \frac{A}{(1+rt)}(1+rt)$$

$$P + Prt = A$$

$$Prt = A - P$$

$$\boxed{r = \frac{A - P}{Pt}}$$

Solve.

16) The equation $D = \frac{1}{2}n(n-3)$ gives the number of diagonals D for a polygon with n sides.

16) _____

Find the number of diagonals for a polygon that has 12 sides.

$$n=12$$

$$D = \frac{1}{2}(12)(12-3)$$

$$= \frac{1}{2}(6)(9)$$

$$= 6 \cdot 9$$

$$= 54$$

$$D = 54 \text{ sides.}$$

Simplify the complex fraction.

17)

$$\frac{\frac{8m^7n^2}{3m}}{\frac{5m^2n^8}{8n^4}}$$

$$= \frac{8m^{\cancel{7}4}n^{\cancel{2}}}{3m^{\cancel{1}}n^{\cancel{8}2}} \cdot \frac{8n^{\cancel{4}}}{5m^{\cancel{2}}n^{\cancel{2}0}}$$

$$\frac{8 \cdot 8m^4}{3 \cdot 5n^2} = \boxed{\frac{64m^4}{15n^2}}$$

17) _____

18)

$$\frac{\frac{64t^2 - 49u^2}{tu}}{\frac{8}{u} - \frac{7}{t}}$$

$$\text{LCD} = tu$$

$$\frac{64t^2 - 49u^2}{tu} \quad (tu)$$

$$(tu) \frac{8-7}{\cancel{t} \cancel{t}} \quad (tu)$$

$$= \frac{64t^2 - 49u^2}{8t - 7u} = \frac{(8t+7u)(8t-7u)}{(8t-7u)} = \boxed{8t-7u}$$

18) _____

Solve.

19) If the average cost per unit $C(x)$ to produce x units of plywood is given by

$$C(x) = \frac{300}{x+10}, \text{ what is the cost per unit if 20 units of plywood are produced?}$$

$$C(20) = \frac{300}{20+10} = \frac{300}{30} = 10$$

the cost is \$10 per unit

19) _____

20) A window washer accidentally drops a bucket from the top of a 256-foot building.

The height h of the bucket after t seconds is given by $h = -16t^2 + 256$. When will the bucket hit the ground?

20) _____

$$h=0$$

$$0 = -16t^2 + 256$$

$$0 = -16(t^2 - 16)$$

$$0 = -16(t+4)(t-4)$$

$$t+4=0 \quad \text{OR} \quad t-4=0$$

time is not negative

$$\boxed{t=4}$$

7

the bucket will hit the ground after 4 seconds.