

## PAP PreCalculus

Simplify (try to get no parenthesis).

$$\frac{x^2 + 3x - 4}{1 - x^2} = \frac{(x+4)(x-1)}{(1-x)(1+x)} \quad \text{the first step is to factor}$$

Example:

$$= \frac{(-1)(x+4)}{1+x} \quad \text{then reduce: } (x-1) \text{ and } (1-x) \text{ reduce to } (-1)$$
$$= -\frac{x+4}{x+1}$$

1.  $\frac{8x+16}{8x-16}$

2.  $\frac{y^2+4y-12}{3y^2-12y+12}$

3.  $\frac{x^3+y^3}{x^2-y^2}$

4.  $\frac{x^2+2x-8}{2x^3+6x^2-8x-24}$

Multiply and simplify.

$$\frac{x-2}{x+1} \cdot \frac{x^2-1}{2x-4} = \frac{x-2}{x+1} \cdot \frac{(x-1)(x+1)}{2(x-2)} \text{ the first step is still to factor if possible}$$

Example:  $= \frac{(x-2)(x-1)(x+1)}{2(x-2)(x+1)}$  the next step is to multiply across the top and across the bottom

$$= \frac{x-1}{2} \text{ finally, reduce}$$

5.  $\frac{x^2-16}{x^2} \cdot \frac{x^2-4x}{x^2-x-12}$

6.  $\frac{y^2-16}{2y+6} \cdot \frac{y+3}{y-4}$

7.  $\frac{x^2-y^2}{x^3-y^3} \cdot \frac{x^2+xy+y^2}{x^2+2xy+y^2}$

Add or subtract. Answers should be simplified when possible.

$$\frac{2}{x-1} - \frac{x+1}{x^2+4x-5} = \frac{2}{x-1} - \frac{x+1}{(x-1)(x+5)} \quad \text{the first step is to factor denominators}$$

Example:

$$= \frac{x+5}{x+5} \cdot \frac{2}{x-1} - \frac{x+1}{(x-1)(x+5)} \quad \text{now find a common denominator}$$

$$= \frac{2x+10-(x+1)}{(x-1)(x+5)}$$

$$= \frac{x+9}{x^2+4x-5}$$

8.  $\frac{3}{x} - \frac{8}{x^2}$

9.  $\frac{r^2}{r-s} + \frac{s^2}{s-r}$

9.  $\frac{4xy}{x^2-y^2} + \frac{x-y}{x+y}$

10.  $\frac{3y}{y^2-7y+10} - \frac{2y}{y^2-8y+15}$

Simplify the complex rational expression.

Example:

$$\frac{\frac{1}{y} + 7}{\frac{1}{y} - 5} = \frac{\frac{1}{y} + \frac{7y}{y}}{\frac{1}{y} - \frac{5y}{y}}$$

The first step is to treat the numerator and the denominator as their own +/- problems

$$= \frac{\frac{1+7y}{y}}{\frac{1-5y}{y}}$$

The goal is to make it a fraction over another fraction.

$$= \frac{1+7y}{y} \div \frac{1-5y}{y}$$

Now rewrite as a division problem.

$$= \frac{1+7y}{y} \cdot \frac{y}{1-5y}$$

Now flip and multiply.

$$= \frac{1+7y}{1-5y}$$

11.  $\frac{\frac{x^2 - y^2}{xy}}{\frac{x - y}{y}}$

12.  $\frac{\frac{3}{4} + \frac{4}{3}}{\frac{x}{y} - \frac{3}{x}}$

13.  $\frac{a - \frac{3a}{b}}{b - \frac{b}{a}}$

14.  $\frac{\frac{x^2 - x - 12}{x^2 - 2x - 15}}{\frac{x^2 + 8x + 12}{x^2 - 5x - 14}}$