Find this sum:

$$\frac{3}{x^2+5x+6}+\frac{2x}{x^2+8x+15}$$

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

Factor all denominators

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

Get denominators to be the same

$$=\frac{2x+7x+15}{(x+5)(x+3)(x+2)}$$

Simplify the numerators by using the Distributive Property and combining like terms.

Complex Fractions: (also known as Compound Fractions)
Fractions whose numerators and/or denominators also have fractions.

Simplify:

$$\frac{\frac{8}{15}}{\frac{24}{35}}=\frac{8}{15}\div\frac{24}{35}=\frac{\cancel{8}^{1}}{\cancel{15}_{3}}\cdot\frac{\cancel{35}^{7}}{\cancel{24}_{3}}=\frac{1\cdot 7}{3\cdot 3}=\frac{7}{9}$$

Simplify:

$$\frac{3+\frac{4}{3}}{\frac{11}{6}-1}$$

There are many methods to do this, I'll focus on two methods.

$$\frac{3+\frac{4}{3}}{\frac{11}{6}-1}\cdot\frac{6}{6}$$

Find LCM of all the denominators in the complex fraction. Then multiply the Numerator and Denominator of the complex fraction by this LCM.

$$\frac{18+8}{11-6}=\boxed{\frac{26}{5}}$$

6. $\dfrac{\frac{3}{1}+\frac{4}{3}}{\frac{11}{6}-\frac{1}{1}} \cdot \dfrac{2}{2}$

Get ALL the "parts" of the complex fraction to have the LCD.
Then you can cancel all of the denominators.

$$\frac{\frac{18}{6}+\frac{8}{6}}{\frac{11}{6}-\frac{6}{6}} = \frac{18+8}{11-6} = \boxed{\frac{26}{5}}$$

Simplify:

$$\frac{\frac{xy^3}{xy^3}\cdot\frac{2}{x}+\frac{5}{y^3}\cdot\frac{x^2}{x^2}}{\frac{y^3}{y^3}\cdot\frac{3}{x^2}-\frac{6}{y^2}\cdot\frac{x^2y}{x^2y}} = \frac{\frac{2xy^3}{x^2y^3}+\frac{5x^2}{x^2y^3}}{\frac{3y^3}{x^2y^3}-\frac{6x^2y}{x^2y^3}} = \boxed{\frac{2xy^3+5x^2}{3y^3-6x^2y}}$$

Simplify:

$$\frac{\frac{10}{x}+\frac{4}{xy}}{\frac{2}{x^2y}-\frac{3}{xy^2}} \cdot \frac{x^2y^2}{x^2y^2} = \boxed{\frac{10xy^2+4xy}{2y-3x}}$$