

Please silence your cell phone.

You must show your steps. If you're unsure whether you have enough work, please ask.

Helpful information

$$x_{\text{coor}} = \frac{-b}{2a} \quad \text{Given } ax^2 + bx + c = 0 \text{ then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{Standard form } y = ax^2 + bx + c \quad \text{Vertex form } y = a(x - h)^2 + k$$

$$\log_a N = \frac{\ln N}{\ln a}$$

1. Expand $\ln\left(\frac{2x}{\sqrt{y}}\right)$ using the logarithmic rules. Simplify when possible.

$$\ln(2x) - \ln y^{1/2} \Rightarrow \ln 2 + \ln x - \frac{1}{2} \ln y$$

2. Condense $3\ln x + 2\ln y - \ln(xy)$ using the logarithmic rules. Simplify when possible.

$$\begin{aligned} \ln x^3 + \ln y^2 - \ln(xy) &\Rightarrow \ln(x^3 y^2) - \ln(xy) \Rightarrow \\ \ln\left(\frac{x^3 y^2}{xy}\right) &\Rightarrow \ln(x^2 y) \end{aligned}$$

3. Solve $\log_2(x+2) + \log_2 x = 3$

$$\log_2 [x(x+2)] = 3$$

$$2^3 = x^2 + 2x$$

$$x^2 + 2x - 8 = 0$$

$$(x+4)(x-2) = 0$$

$$\cancel{x = -4} \quad x = 2$$

check

$$\log_2 4 + \log_2 2$$

$$2 + 1$$

$$3 \checkmark$$

4. Factor, and if possible, reduce. $\frac{x^2 - 36}{x^2 + 4x - 12} = \frac{(x-6)(\cancel{x+6})}{(\cancel{x+6})(x-2)}$

$$\frac{x-6}{x-2}$$

5. Simplify $\frac{k^2 + 9k + 14}{k^3 + 8} \div \frac{k^2 + 7k}{k^2 - 2k + 4}$

$$\frac{k^2 + 9k + 14}{k^3 + 8} \cdot \frac{k^2 - 2k + 4}{k^2 + 7k} \Rightarrow \frac{(k+7)(k+2)}{(k+2)(k^2 - 2k + 4)} \cdot \frac{k^2 - 2k + 4}{k(k+7)}$$

$$\frac{1}{k}$$

6. Simplify $\frac{3k-7}{2k} + \frac{5k+8}{2k} - \frac{4k-1}{2k}$.

$$\frac{3k-7+5k+8-4k+1}{2k} \Rightarrow \frac{2(2k+1)}{2k}$$

$$\frac{4k+2}{2k}$$

$$\boxed{\frac{2k+1}{k}}$$

7. Simplify $\frac{6k+5}{k^2+4k+3} - \frac{5k+2}{k^2+4k+3}$.

$$\frac{6k+5-5k-2}{k^2+4k+3} \Rightarrow \frac{k+3}{(k+3)(k+1)} \Rightarrow \boxed{\frac{1}{k+1}}$$

8. Simplify $\frac{y+x}{xy} - \frac{1}{x} + \frac{1}{y^2}$.

LCD = xy^2

$$\frac{y(y+x)}{xy^2} - \frac{y^2}{xy^2} + \frac{x}{xy^2} \Rightarrow \frac{y^2+xy-x^2+x}{xy^2}$$

$$\frac{xy+x}{xy^2} \Rightarrow \frac{\cancel{x}(y+1)}{\cancel{x}y^2} \Rightarrow \boxed{\frac{y+1}{y^2}}$$

9. Simplify $\frac{x+3}{x-4} + \frac{-21}{x^2-5x+4} + \frac{x-6}{x-1}$.

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

$$\frac{x+3}{x-4} + \frac{-21}{(x-4)(x-1)} + \frac{x-6}{x-1}$$

$$\frac{(x+3)(x-1)}{(x-4)(x-1)} + \frac{-21}{(x-4)(x-1)} + \frac{(x-6)(x-4)}{(x-4)(x-1)} \Rightarrow \frac{2x^2-8x}{(x-4)(x-1)}$$

$$\frac{x^2+2x-3-21+x^2-10x+24}{(x-4)(x-1)} \Rightarrow \frac{2x^2-8x}{(x-4)(x-1)}$$

$$\boxed{2x}$$

10. Given $\frac{x+3}{x} = \frac{5}{2} + \frac{3}{2x}$ list any excluded value(s) and then solve the equation.

$$x \neq 0 \quad \text{LCD} = 2x$$

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

$$2(x+3) = 5x + 3 \quad \rightarrow 3x = 3$$

$$2x + 6 = 5x + 3$$

$$6 = 3x + 3$$

$$\boxed{x=1}$$

11. Given $\frac{-2}{a^2-a-2} - \frac{2}{a-2} = \frac{6}{a+1}$ list any excluded value(s) and then solve the equation.

$$(a-2)(a+1) \quad x \neq 2 \quad x \neq -1 \quad \text{LCD} (a-2)(a+1)$$

$$\frac{-2(a-2)(a+1)}{(a-2)(a+1)} - \frac{2(a-2)(a+1)}{(a-2)(a+1)} = \frac{6(a-2)(a+1)}{a+1}$$

$$-2(a+1) - 2 = 6(a-2)$$

$$-2a - 2 - 2 = 6a - 12$$

$$-2a - 4 = 6a - 12$$

$$8 = 8a$$

$$1 = a$$

12. For the function $f(x) = x^2 + 3x$ find and simplify

<p>a) $f(2)$</p> $f(2) = 2^2 + 3(2)$ $4 + 6$ 10	<p>b) $f(-4)$</p> $(-4)^2 + 3(-4)$ $16 - 12$ 4	<p>c) $f(a+1)$</p> $(a+1)^2 + 3(a+1)$ $a^2 + 2a + 1 + 3a + 3$ $a^2 + 5a + 4$
<p>d) $-f(3)$</p> $-f(3)$ $-(3^2 + 3(3))$ $-(9 + 9)$ -18	<p>e) $f(k+1) - f(k)$</p> $f(k+1) = (k+1)^2 + 3(k+1)$ $k^2 + 2k + 1 + 3k + 3$ $k^2 + 5k + 4 - (k^2 + 3k)$ $f(k) = k^2 + 3k$ $(2k + 4)$	

13. For the functions $f(x) = x - 7$ and $g(x) = 2x + 5$ find and simplify

<p>f) $(f+g)(x)$</p> $x + 7 + 2x + 5$ $3x + 12$	<p>g) $(f+g)(2)$</p> $f(2) = -5$ $g(2) = 9$ $-5 + 9 = 4$	<p>h) $(f-g)(x)$</p> $x - 7 - (2x + 5)$ $x - 7 - 2x - 5$ $-x - 12$
<p>i) $(f \cdot g)(x)$</p> $(x-7)(2x+5)$ $2x^2 + 5x - 14x - 35$ $2x^2 - 9x - 35$	<p>j) $(f \cdot g)(1) - (f+g)(1)$</p> $f(1) = -6$ $g(1) = 7$ $(f \cdot g)(1) = -6(7) = -42$ $(f+g)(1) = -6 + 7 = 1$ $-42 - 1 = -43$	

14. Simplify

a) $\sqrt{-16}$

$i\sqrt{16}$

$i(4)$

$4i$

b) $6(i-1) - (2i+1) + 2(2i-1)$

~~$6i - 6 - 2i - 1 + 4i - 2$~~

$8i - 9$

c) $\sqrt{-5}\sqrt{-15}$

$i\sqrt{5}i\sqrt{15}$

$i^2\sqrt{75}$

$(-1)\sqrt{25 \cdot 3}$

$-5\sqrt{3}$

d) $(3-i)(1-4i)$

$3 - 12i - i + 4i^2$

$3 - 13i + 4(-1)$

$3 - 13i - 4$

$-1 - 13i$

e) $(1-i)^3$

$(1-i)(1-i)$

$1 - i - i + i^2$

~~$1 - 2i + (-1)$~~

$-2i$

$-2i(1-i)$

$-2i + 2i^2$

$-2i + 2(-1)$

$-2 - 2i$

