Topic: Multivariable rational equations

Question: Solve the equation for x.

$$\frac{1}{x} + m + ab = c$$

Answer choices:

A $x = -\dfrac{1}{m + ab - c}$

B $x = -m - ab + c$

C $x = \dfrac{1}{m + ab - c}$

D $x = m + ab - c$

Solution: A

In order to get rid of the fraction, we have to multiply both sides of the equation by the denominator of $1/x$.

$$\frac{1}{x} + m + ab = c$$

$$\left(\frac{1}{x} + m + ab\right) x = (c)x$$

$$\frac{1}{x}(x) + m(x) + ab(x) = c(x)$$

$$1 + mx + abx = cx$$

To solve for x, we'll need to collect all terms containing x on one side of the equation, and then factor out the x.

$$mx + abx - cx = -1$$

$$x(m + ab - c) = -1$$

$$x = \frac{-1}{m + ab - c}$$

$$x = -\frac{1}{m + ab - c}$$

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Question: Solve the equation for x.

$$\frac{1}{x}+\frac{b}{a}=c$$

Answer choices:

A $x=\dfrac{a}{b-ac}$

B $x=\dfrac{b-ac}{a}$

C $x=\dfrac{a}{ac-b}$

D $x=\dfrac{ac-b}{a}$

Solution: C

In order to get rid of the fractions, we have to multiply both sides of the equation by the denominators of both fractions, x and a.

$$\frac{1}{x}+\frac{b}{a}=c$$

$$\left(\frac{1}{x}+\frac{b}{a}\right)ax=(c)ax$$

$$\frac{1}{x}(ax)+\frac{b}{a}(ax)=c(ax)$$

$$a+bx=acx$$

To solve for x, we'll need to collect all terms containing x on one side of the equation.

$$a=acx-bx$$

To end up with the variable that we're solving for (in this case x) on the left side, we'll switch the two sides of this equation, and then factor out an x and solve for it.

$$acx-bx=a$$

$$x(ac-b)=a$$

$$x=\frac{a}{ac-b}$$

Topic: Multivariable rational equations

Question: Solve the equation for k.

$$\frac{mx+b}{k}+a=z$$

Answer choices:

A $k=\dfrac{a-z}{-mx-b}$

B $k=\dfrac{a-z}{mx+b}$

C $k=\dfrac{mx+b}{z-a}$

D $k=\dfrac{mx+b}{a-z}$

Solution: C

In order to get rid of the fraction, we have to multiply both sides of the equation by the denominator of $(mx + b)/k$.

$$\frac{mx + b}{k} + a = z$$

$$\left(\frac{mx + b}{k} + a\right) k = (z)k$$

$$\frac{mx + b}{k}(k) + a(k) = z(k)$$

$$mx + b + ak = zk$$

To solve for k, we'll need to collect all terms containing k on one side of the equation, and then factor out the k.

First, we'll move zk to the left side, by subtracting zk from both sides.

$$mx + b + ak - zk = zk - zk$$

$$mx + b + ak - zk = 0$$

Next, we'll move $mx + b$ to the right side, by adding $-mx - b$ to both sides.

$$mx + b + ak - zk - mx - b = 0 - mx - b$$

Now we'll combine like terms on the left side.

$$mx - mx + b - b + ak - zk = 0 - mx - b$$

$$ak - zk = - mx - b$$

$$k(a-z) = -mx - b$$

$$\frac{k(a-z)}{a-z} = \frac{-mx-b}{a-z}$$

$$k = \frac{-mx-b}{a-z}$$

We have negative signs in both terms of the numerator. To get rid of them, we'll multiply the numerator and denominator of the fraction by -1 (remember that $(-1)/(-1) = 1$, so when we do this we won't change the value of anything in our equation) and then simplify.

$$k = \frac{-1(-mx-b)}{-1(a-z)}$$

$$k = \frac{mx+b}{-a+z}$$

Finally, we'll switch the two terms in the denominator.

$$k = \frac{mx+b}{z-a}$$