

Problem 1.

$$2x + 3y = 10$$

What is the value of y that maximizes xy ?

Solution)

Our first goal is to make xy into a function of y only.

To do that, we want to make x as a function of y .

We do this by solving $2x + 3y = 10$ for x .

$$2x + 3y - 3y = 10 - 3y$$

$$2x = 10 - 3y$$

$$2x \div 2 = (10 - 3y) \div 2$$

$$x = 5 - \frac{3}{2}y$$

So now we use this to change xy into a function of y only.

$$xy = \left(5 - \frac{3}{2}y\right)y = 5y - \frac{3}{2}y^2 = -\frac{3}{2}y^2 + 5y.$$

Now we see what we have to do.

Since we are looking for the maximum of a quadratic function, we need to use the formula $-\frac{b}{2a}$.

$$y = -\frac{b}{2a} = -\frac{5}{2\left(-\frac{3}{2}\right)} = \frac{5}{3}.$$

So the answer is $y = \frac{5}{3}$.

Here is what I want you to write on the sheet.

$$2x + 3y = 10$$

What is the value of y that maximizes xy ?

$$x = 5 - \frac{3}{2}y$$

$$xy = -\frac{3}{2}y^2 + 5y$$

$$y = -\frac{5}{2\left(-\frac{3}{2}\right)} = \frac{5}{3}$$

This is all you need to write.

Problem 2. Find the inverse function

$$y = \frac{2x - 1}{4x + 3}$$

We've done this several times, but let's do it one more time.

1. Swap x and y . (You do this whenever you are trying to get an inverse of a function.)

$$x = \frac{2y - 1}{4y + 3}$$

2. Cross multiply – or - Take the denominator to the other side.

$$x(4y + 3) = 2y - 1$$

3. Multiply out = Distribute = FOIL the left side.

$$4xy + 3x = 2y - 1$$

4. Move whatever term that has y to one side and whatever that does not have y to the other side.

$$4xy - 2y = -3x - 1$$

(You should be careful about the sign changes.)

5. Factor out y .

$$(4x - 2)y = -3x - 1$$

6. Divide

$$y = \frac{-3x - 1}{4x - 2}$$

Done!

On the sheet, just write what happens at step 3, and step 6.