PART 1

Directions

For each equation below, label part of the given equation as "u." Write this part of the equation in the $u =$ box. After labeling u, find the derivative of u. Write your answer in the $u' = du =$ box. Once you find du, see if it looks like part of the equation given to you.

1. $y' = 3(x^2 - 4x)^2(2x - 4)$	$u =$
	$u' = du =$

2. $y' = 2x\, e^{x^2}$	$u =$
	$u' = du =$

3. $y' = \cos(x^3 - 5x)\,(3x^2 - 5)$	$u =$
	$u' = du =$

4. $\int \frac{\cos(x)}{\sin(x)} dx$	$u =$	
	$u' = du =$	

5. $\int 4(x - 4x^2)^3(1 - 8x)dx$	$u =$	
	$u' = du =$	

PART 2

Directions

You're probably wondering at this point where the dx comes into play and how we deal with it. In this section, we want to make substitutions that deal with dx.

Recall the following:

1. If I find the derivative of $y = x^2$, I can write the derivative as $y' = 2x$. How else could I represent y'? If you have a tough time figuring it out, think back to implicit differentiation or Leibniz's notation for derivatives, or check in with your group or teacher to find the answer.

2. Assuming you found the answer on your own, we can now represent y' as $\frac{dy}{dx}$. So, go back to problem no. 1 from Part 1. (I'll write it below, so you don't have to.) Notice how the equation we started with can be manipulated. Discuss with your partner how the manipulation occurred.

<table>
<tr><td rowspan="2">$y' = 3(x^2 - 4x)^2(2x - 4)$

or

$\frac{dy}{dx} = 3(x^2 - 4x)^2(2x - 4)$

or

$dy = 3(x^2 - 4x)^2(2x - 4)dx$</td><td>$u =$</td></tr>
<tr><td>$u' = du =$</td></tr>
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After you have discussed, go ahead and relabel u and du. This time, be sure to include dx in your substitution. Remember, when you find the derivative of u, we can write it as du/dx and move the dx to the other side via multiplication.

3. Now you are substituting. Try this one: Substitute each part of the equation with the appropriate u and du. Check in with your teacher or group to ensure you're on the right track.

$$\int \cos(3x^2)\, 6x\, dx \qquad u =$$

$$du =$$