



The Product Rule “one dee two plus two dee one”

1. Check for two clusters of variables (functions) being multiplied together.

1st  2nd 

$$(3x + 1)(1 - x^2)$$

2. Identify the first function and attach coefficients to it (if present). This is chunk 1.

$$(3x + 1)(1 - x^2)$$

3. Identify the second function. This is chunk 2

$$(3x + 1)(1 - x^2)$$

4. Differentiate chunk 1 with respect to the given variable

$$\frac{d}{dx}(3x + 1) = 3$$

5. Differentiate chunk 2 with respect to the given variable

$$\frac{d}{dx}(1 - x^2) = -2x$$

6. Multiply the first chunk (#2) with the derivative of the second chunk (#5)

$$(3x + 1)(-2x) = -6x^2 - 2x$$

7. Multiply the second chunk (#3) with the derivative of the first chunk (#4).

$$(1 - x^2)(3) = 3 - 3x^2$$

8. Add #6 and #7. This is the derivative of your product!

$$(-6x^2 - 2x) + (3 - 3x^2) = \frac{d}{dx}((3x + 1)(1 - x^2))$$

$$-9x^2 - 2x + 3 = \frac{d}{dx}((3x + 1)(1 - x^2))$$

9. KEY CHECK: Check with phrase (or by another method):

“one dee two plus two dee one”

(Note: ‘dee’ refers to the derivative of the part that follows)

The Quotient Rule

“low dee high minus high dee low all over low squared”

<p>1. Check for division among polynomials</p> <p style="text-align: center;">DIVISION!</p> $\frac{x}{1-2x}$	<p>2. Identify the polynomials on top and bottom. These will be called “high” and “low” respectively</p> $\frac{x}{1-2x}$ <p style="text-align: center;">high low</p>	<p>3. Differentiate the “high” portion with respect to the given variable.</p> $\frac{d}{dx}(x) = 1$
<p>4. Differentiate the “low” portion with respect to the given variable.</p> $\frac{d}{dx}(1-2x) = -2$	<p>5. Multiply “low” and the result from #3</p> $(1-2x)(1) = 1-2x$	<p>6. Multiply “high” and the result from #4.</p> $(x)(-2) = -2x$
<p>7. Square “low”</p> $(1-2x)^2 = 1-4x+4x^2$	<p>8. Insert into following form: (#5-#6)/(#7) and simplify (unless very timely). This is your derivative!</p> $\frac{(1-2x) - (-2x)}{1-4x+4x^2} = \frac{d}{dx}\left(\frac{x}{1-2x}\right)$ <div style="border: 2px solid red; padding: 5px; width: fit-content; margin: 10px auto;"> $\frac{1}{1-4x+4x^2} = \frac{d}{dx}\left(\frac{x}{1-2x}\right)$ </div>	<p>9. KEY CHECK: Check with phrase:</p> <p><i>“low dee high minus high dee low all over low squared”</i></p> <p>(Note: ‘dee’ refers to the derivative of the part that follows)</p>