WORKSHEET: PRODUCT AND QUOTIENT RULES

Names and student IDs: _____

Recall the most recent differentiation rules we have seen:

(1) If f and g are differentiable, and $j(x) = f(x)g(x)$ for all x (in a suitable open interval), then $j'(x) = f'(x)g(x) + f(x)g'(x)$.

(2) Quotient rule: If f and g are differentiable, $g(x)$ is never zero (on a suitable open interval) and

$$j(x) = \frac{f(x)}{g(x)}$$

for all x (in a suitable open interval), then

$$j'(x) = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}.$$

(3) The functions sin and cos are differentiable everywhere, and (using **radians!**)

$$\sin'(x) = \cos(x) \qquad \text{and} \qquad \cos'(x) = -\sin(x)$$

for all x.

Now differentiate the following functions, or else tell me that no differentiation rule you have seen so far applies:

If $s(x) = x^3 \sin(x)$ then $s'(x) =$

If $s(x) = \dfrac{\sin(x)}{x^2 + 1}$ then $s'(x) =$

If $w(t) = (3t^2 + t)\cos(t) + t^6$ then $w'(t) =$

$\dfrac{d}{dx}\big((x^2 + 3x)(11x^7 - 102x^3)\big) =$

If $q(x) = \dfrac{x^3 \sin(x)}{x^2 + 1}$ then $q'(x) =$

$\dfrac{d}{dx}\big(7^x\big) =$

Date: 24 January 2024.