

**GOAL: To explore differentiation rules and formulas through an “order of operations” perspective**

1. State whether each of the given statements is true or false. If the statement is *true*, identify it by name. If the statement is *false*, make it *true* by replacing everything that comes after “is equal to” with appropriate verbiage, and identify the *corrected* statement by name.

**Examples:**

- a. The derivative of the sum of two functions is equal to the sum of the derivatives of those functions.

**ANSWER:** True (sum rule).

- b. The derivative of the product of two functions is equal to the product of the derivatives of those functions.

**ANSWER:** False. The derivative of the product of two functions is equal to the first function times the derivative of the second, plus the second function times the derivative of the first (product rule).

OK, these ones are for you:

- c. The derivative of the reciprocal of a function is equal to the reciprocal of the derivative of that function.

- d. The derivative of a constant times a function is equal to the constant times the derivative of that function.

- e. The derivative of a chain of two functions is equal to the chain of the derivatives of those functions.

- f. The derivative of the quotient of two functions is equal to the top function times the derivative of the bottom, minus the bottom function times the derivative of the top, all divided by the bottom function squared.

2. Listed below are ten mathematical statements: **not all of them are true!** Match each of these statements with either a *correct* or an *incorrect* version of a statement from problem 1 above. We've done the first two for you, to illustrate what we mean.

(i)  $\frac{d}{dx}[f(x)g(x)] = f'(x)g'(x)$     **ANSWER: (b), incorrect version**

(ii)  $\frac{d}{dx}[cf(x)] = cf'(x)$     **ANSWER: (d), correct version**

OK, here are the rest:

(iii)  $\frac{d}{dx}\left[\frac{1}{f(x)}\right] = \frac{-f'(x)}{(f(x))^2}$     **ANSWER:**

(iv)  $\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$     **ANSWER:**

(v)  $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f(x)g'(x) - g(x)f'(x)}{(g(x))^2}$     **ANSWER:**

(vi)  $\frac{d}{dx}[f(g(x))] = f'(g'(x))$     **ANSWER:**

(vii)  $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$     **ANSWER:**

(viii)  $\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$     **ANSWER:**

(ix)  $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$     **ANSWER:**

(x)  $\frac{d}{dx}\left[\frac{1}{f(x)}\right] = \frac{1}{f'(x)}$     **ANSWER:**