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1. Differentiate each of the following functions. Make any obvious simplifications.

[5] (a)  $y = \sin^3(\csc(x))$

[5] (b)  $y = \sin(x^3 \csc(x))$

[5] (c)  $y = x^3 \sin(\csc(x))$

[5] (d)  $y = x^{\sqrt{x}}$

[5] (e)  $f(x) = x^5 \ln(x) \tan(x)$

[5] (f)  $f(x) = \frac{e^{3x} - 1}{e^{3x} + 1}$

[5] 2. Find  $\frac{dy}{dx}$  given that  $x^2 \cos(y) = \sec(6x) - 8y$ .

[5] 3. Use the limit definition of the derivative to prove the Constant Multiple Rule:

$$[k \cdot f(x)]' = k \cdot f'(x)$$

for any constant  $k$ .