Derivative shortcuts and anti-shortcuts

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Shortcuts

these are good

(0) $d/dx\,(c) = 0$ — derivative of a constant

(1) $d/dx\,(mx + b) = m$ when m, b are constant — derivative of a line

(2) $d/dx\,(x^n) = nx^{n-1}$ — power rule

(3) $d/dx\,(f \pm g) = f' \pm g'$ — derivative of a sum

(4) $d/dx\,(cf) = cf'$ when c is constant — derivative of a constant multiple

(5) $d/dx\,(\sin x) = \cos x$

(6) $d/dx\,(\cos x) = -\sin x$

(7) $d/dx\,(\ln x) = 1/x$

(8) $d/dx\,(e^x) = e^x$

(9) $d/dx\,(fg) = f' \cdot g + f \cdot g'$ — product rule

(10) $d/dx\,(f/g) = (f' \cdot g - f \cdot g')/g^2$ — quotient rule

(11) other trig functions

- (a) $d/dx\,(\tan x) = \sec^2 x$
- (b) $d/dx\,(\cot x) = -\csc^2 x$
- (c) $d/dx\,(\sec x) = \sec x \tan x$
- (d) $d/dx\,(\csc x) = -\csc x \cot x$

(12) $d/dx\,(f \circ g) = (f' \circ g) \cdot g'$, or, — chain rule
$d/dx\,[f\,(g\,(x))] = f'\,(g\,(x)) \cdot g'\,(x)$, or,
$dy/dx = dy/du \cdot du/dx$

(13) $d/dx\,(a^x) = a^x \ln a$

Anti-shortcuts

these are bad

(-1) $d/dx\,(fg) \neq f' \cdot g'$

(-2) $d/dx\,(f/g) \neq f'/g'$

(-3) $d/dx\,(a^x) \neq xa^{x-1}$