3.1-3.2 Differentiation Quiz **Name:** Key

1. Complete the following derivative rules:

   a) constant all by its lonesome rule $(c)' = 0$

   b) constant multiple rule $[cf(x)]' = cf'(x)$

   c) sum rule $[f(x)+g(x)]' = f'(x)+g'(x)$

   d) power rule $(x^n)' = nx^{n-1}$

   e) natural exponential function rule $(e^x)' = e^x$

   f) ugly exponential function rule $(b^x)' = b^x \ln b$

2. Find $f'(x)$ for each function given. It is not necessary to simplify.

   a) $f(x)=3+e+3^3+e^e+e^3+3^e+x^3+x^e+e^x+3^x+\ln 3$

$f'(x) = 0+0+0+0+0+0+3x^2+ex^{e-1}+e^x+3^x\ln 3+0$

   b) $f(x)=\pi^e+e^\pi+\pi x^e+e^\pi+x^\pi+\pi e^x+\pi^x$

$f'(x) = 0+0+\pi ex^{e-1}+0+\pi x^{\pi-1}+\pi e^x+\pi^x\ln\pi$

   c) $f(x)=3e^2-5x^4+2\cdot 3^x-3x^{3/2}+7x^{-5}+9e^x-8x^{-3/5}$

$f'(x) = 0-20x^3+2\cdot 3^x\ln 3-\frac{9}{2}x^{\frac{1}{2}}-35x^{-6}+9e^x+\frac{24}{5}x^{-\frac{8}{5}}$

   d) $f(x)=\frac{e^8}{4}-\frac{e}{x^{10}}+\frac{1}{e}-\frac{e}{x}+56\sqrt[8]{x^9}+\frac{54}{\sqrt[7]{x^6}}$

$f(x) = \frac{e^8}{4}-ex^{-10}+\frac{1}{e}-ex^{-1}+56x^{\frac{9}{8}}+54x^{-\frac{6}{7}}$ ← algebra

$f'(x) = 0+10ex^{-11}+0+ex^{-2}+63x^{\frac{1}{8}}-\frac{324}{7}x^{-\frac{13}{7}}$ ← calculus

3. Find the equation of the tangent line to $f(x)=e^x+10$: a) at $x=3$ b) at $x=\ln 3$

a) $x_1 = 3$

$y_1 = f(3) = e^3+10$

$f(x) = e^x+10$

$f'(x) = e^x$

$f'(3) = e^3$

$y-y_1 = m(x-x_1)$

$y-(e^3+10) = e^3(x-3)$

$y-e^3-10 = e^3x-3e^3$

$y = e^3x-3e^3+e^3+10$

$y = e^3x-2e^3+0$

>

b) $f(x) = e^x + 10$

$f'(x) = e^x$

$x_1 = \ln 3$

$y_1 = f(\ln 3) = e^{\ln 3} + 10 = 3 + 10 = 13$

$f'(\ln 3) = e^{\ln 3} = 3$

$y - y_1 = m(x - x_1)$

$y - 13 = 3(x - \ln 3)$

$y - 13 = 3x - 3\ln 3$

$y = 3x - 3\ln 3 + 13$