Name: ______________________________

1. [12 points] Compute the derivatives of the following functions.

a. $f(x) = e^{(\sin(x))}$

$f'(x) = \cos(x)\, e^{\sin x}$

b. $f(x) = \dfrac{x^2 - x}{\cos(x)}$

$f'(x) = \dfrac{(\cos(x))(2x-1) - (x^2-x)(-\sin(x))}{\cos^2 x}$

c. $f(x) = \ln(x^2 - e^x)$; $f(x) = (\sec(x) + x)^2$; $f(x) = \tan(x^3)$;

$f'(x) = \dfrac{2x - e^x}{x^2 - e^x}$; $f'(x) = 2(\sec(x) + x)(\sec x \tan x + 1)$; $f'(x) = (\sec^2(x^3))(3x^2)$

d. $f(x) = \dfrac{x^{1/2}}{2} + \dfrac{2}{\sqrt[3]{x}} + \dfrac{1}{\sqrt{5}}$ $= \frac{1}{2} x^{1/2} + 2x^{-1/3} + \frac{1}{\sqrt{5}}$

$f'(x) = \frac{1}{4} x^{-1/2} - \frac{2}{3} x^{-4/3} + 0$

e. $f(x) = \log_5(x^b \cos x)$ (where $b > 1$); $\xrightarrow{\text{or}}$ $= \log_5(x^b) + \log_5 \cos x$

$= b \log_5 x + \log_5 \cos x$

$f'(x) = \dfrac{1}{(\ln 5)(x^b \cos(x))} \cdot (b x^{b-1} \cos x + x^b(-\sin(x)))$

$f'(x) = \dfrac{b}{(\ln 5)x} + \dfrac{-\sin(x)}{(\ln 5)\cos(x)}$

f. $f(x) = \left(e^{x/7} + \cos(x)\right)^{3/4}$

$f'(x) = \frac{3}{4}(e^{x/7} + \cos(x))^{-1/4}(\frac{1}{7} e^{x/7} - \sin(x))$

g. $y = 8\left(\frac{\pi - x}{2}\right)^8$

$y' = 8 \cdot 8\left(\frac{\pi - x}{2}\right)^7\left(\frac{-1}{2}\right)$

h. $f(x) = \arctan(3x)$; $f(x) = \arcsin(3x)$

$f'(x) = \frac{3}{1+9x^2}$; $f'(x) = \frac{3}{\sqrt{1-9x^2}}$

i. $f(x) = \frac{4^x}{x\sin(4)}$

$f'(x) = \frac{\sin(4)x \cdot (\ln 4)4^x - 4^x \sin(4)}{(x\sin(4))^2}$

j. $f(x) = (\ln(4+x+x^2))^3$

$f'(x) = 3(\ln(4+x+x^2))^2\left(\frac{1}{4+x+x^2}\right)(1+2x)$

k. $f(x) = e^{-3x} + e^2 + x^\pi$

$f'(x) = -3e^{-3x} + \pi x^{\pi-1}$

l. Find $\frac{dy}{dx}$ for $x^3 + e^y = 25 + y\sin(x)$. You must solve for $\frac{dy}{dx}$.

$3x^2 + e^y\frac{dy}{dx} = \frac{dy}{dx}\sin(x) + y\cos x$

$\frac{dy}{dx}(e^y - \sin(x)) = y\cos(x) - 3x^2$

$\frac{dy}{dx} = \frac{y\cos(x) - 3x^2}{e^y - \sin(x)}$