Name: _____ _____ **/ 25**

Please circle your section: 901 (Gossell) 902 (Gossell) 903 (Graves-McCleary)

No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. [12 points] Find the derivatives of each of the following functions. Use correct derivative notation. You do not need to simplify your answers.

a. $f(x) = e^x + x^e + e^e$

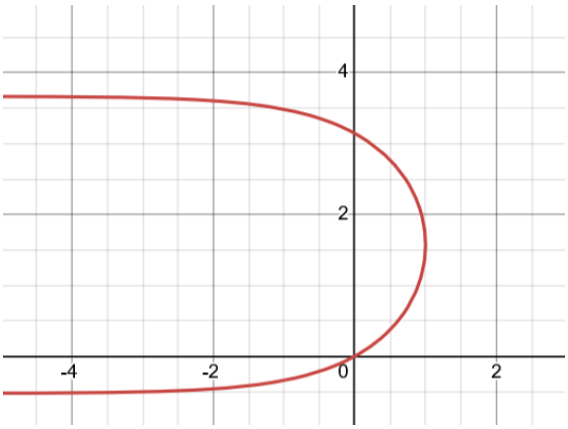
b. $g(x) = \arctan(x^2)$

c. $h(x) = \log_3(x)\arccos(e^x)$

d. $r(\theta) = \ln\left(\dfrac{\cos(\theta)}{\sqrt{2\theta+3}}\right)$ (Hint: You may want use log properties to simplify first.)

2. [9 points] Part of the graph of $3^x - 2\sin(y) = 1$ is shown below.

a. Sketch the **tangent line** to this graph at the point $(0,0)$.



b. Use implicit differentiation to find $\dfrac{dy}{dx}$.

c. Use your answer in (b) to find the **slope** of the tangent line to $(0,0)$.

3. [4 points] Considter the function $y = (3x+1)^x$.

a. Write down **your first step** in finding $\dfrac{dy}{dx}$.

b. Choose the correct expression for $\dfrac{dy}{dx}$. (**Circle one.**)

(I) $3x(3x+1)^{x-1}$

(II) $3x(3x+1)^{x-1}\left(\dfrac{\ln(3x+1)}{3x+1}\right)$

(III) $(3x+1)^x\left(\ln(3x+1)+\dfrac{x}{3x+1}\right)$

(IV) $(3x+1)^x\ln(3x+1)$

(V) $(3x+1)^x\left(\ln(3x+1)+\dfrac{3x}{3x+1}\right)$

(VI) $(3x+1)^x+\dfrac{\ln(3x+1)}{3x+1}$