This is Swift's solutions, using rules as he taught them.

ID Check ________________ Time Started ________________

Name ______________________________ Section/Professor ______________

MAT 136: CALCULUS I
GATEWAY EXAM - VERSION D
Full Pass requires 7 or 8 problems; Half Pass 5 or 6. No partial credit
NO CALCULATOR OR SCRATCH PAPER
BOX FINAL ANSWERS

In each case, find the derivative of the given function. It is not necessary to simplify the result algebraically.

1. $f(x) = \frac{x^2 - 3x + 2}{x^2 + 2}$; $f'(x) = \frac{\frac{d}{dx}[x^2-3x+2](x^2+2) - (x^2-3x+2)\frac{d}{dx}[x^2+2]}{(x^2+2)^2}$

This can be simplified, but don't simplify here $\Rightarrow$ $= \frac{(2x-3)(x^2+2) - (x^2-3x+2)(2x)}{(x^2+2)^2}$

2. $f(x) = e^{\cos(x)}\cos(x)$

$f'(x) = \frac{d}{dx}[e^{\cos(x)}]\cos(x) + e^{\cos(x)}\frac{d}{dx}[\cos(x)]$

$= e^{\cos(x)}\frac{d}{dx}[\cos(x)]\cdot\cos(x) + e^{\cos(x)}(-\sin(x))$

$= \boxed{e^{\cos(x)}(-\sin(x))\cdot\cos(x) + e^{\cos(x)}(-\sin(x))} = \boxed{-e^{\cos(x)}\sin(x)(\cos(x)+1)}$

OK OK too

3. $g(x) = \ln(\tan(x))$

$g'(x) = \frac{1}{\tan(x)}\cdot\frac{d}{dx}\tan(x) = \boxed{\frac{1}{\tan(x)}\cdot\frac{1}{\cos^2(x)}}$ OK

$= \boxed{\frac{1}{\tan(x)}\cdot\sec^2(x)}$ OK $= \boxed{\frac{\cos(x)}{\sin(x)}\cdot\frac{1}{\cos^2(x)}} = \boxed{\frac{1}{\sin(x)\cos(x)}}$

4. $f(t) = \frac{t^{3/2} - t + t^{1/2}}{\sqrt{t^3}} = \frac{t^{\frac{3}{2}} - t^1 + t^{\frac{1}{2}}}{t^{3/2}} = t^{-3/2}(t^{3/2} - t^1 + t^{\frac{1}{2}}) = 1 - t^{-\frac{1}{2}} + t^{-1}$

so $f'(t) = \boxed{\frac{1}{2}t^{-\frac{3}{2}} - t^{-2}}$

Quotient rule can be used, but it is much more work.

Note: ~~me~~ Morize or be able to derive the formula $\frac{d}{dx}a^x = \ln(a)\cdot a^x$

Derivation:

$$\frac{d}{dx}a^x = \frac{d}{dx}\left[e^{\ln(a^x)}\right] = \frac{d}{dx}\left[e^{x\ln(a)}\right] = e^{x\ln(a)}\cdot\frac{d}{dx}\left[x\ln(a)\right] = e^{x\ln(a)}\cdot\ln(a)$$

$$= a^x\cdot\ln(a)$$

5. $f(x) = \sin(\ln(x^2+1))$

$$f'(x) = \cos(\ln(x^2+1))\cdot\frac{d}{dx}\left[\ln(x^2+1)\right]$$

$$= \cos(\ln(x^2+1))\cdot\frac{1}{x^2+1}\frac{d}{dx}\left[x^2+1\right]$$

$$= \boxed{\cos(\ln(x^2+1))\cdot\frac{1}{x^2+1}\cdot 2x} = \boxed{\cos(\ln(x^2+1))\cdot\frac{2x}{x^2+1}}$$

6. $f(x) = \arctan(x^2)$

$$f'(x) = \frac{1}{1+(x^2)^2}\cdot\frac{d}{dx}\left[x^2\right] = \boxed{\frac{1}{1+x^4}\cdot 2x} = \boxed{\frac{2x}{1+x^4}}$$

7. $g(t) = e^{e^{t^2}}$ $= e^{e^{t^2}} = \exp(\exp(t^2))$, using $\exp(x) = e^x$ Notation.

$$g'(t) = e^{e^{t^2}}\cdot\frac{d}{dt}\left[e^{t^2}\right] = e^{e^{t^2}}\cdot e^{t^2}\cdot\frac{d}{dt}\left[t^2\right] = \boxed{e^{e^{t^2}}\cdot e^{t^2}\cdot 2t}$$

8. $f(t) = 4^t\cos(4t)$ see note above. $\frac{d}{dt}4^t = \ln(4)\cdot 4^t$.

$$f'(t) = \frac{d}{dt}\left[4^t\right]\cos(4t) + 4^t\frac{d}{dt}\cos(4t)$$

$$= \ln(4)\cdot 4^t\cos(4t) + 4^t(-\sin(4t))\frac{d}{dt}(4t)$$

$$= \boxed{\ln(4)\cdot 4^t\cos(4t) - 4^t\sin(4t)\cdot 4}$$ OK

$$= \boxed{4^t\left(\ln(4)\cos(4t) - 4\sin(4t)\right)}$$ OK TOO