Math 1220-003 Quiz 1

June 14, 2018

You have until the start of class on Monday to complete this quiz. Make sure to write your name at the top of the quiz. This quiz is two questions, worth 20 points.

1. (10 points) Let $f(x) = \exp(x + \sin(x))$. Find $(f^{-1})'(1)$. (Hint: what's $f(0)$?)

$$f(0) = \exp(0 + \sin(0)) = e^{0+0} = 1$$

By a theorem from 6.2 :

$$(f^{-1})'(1) = \frac{1}{f'(0)}$$

$$f'(x) = e^{x+\sin(x)} \cdot (1 + \cos(x))$$

$$f'(0) = e^{0} \cdot (1+1) = 2$$

$$\Rightarrow \boxed{(f^{-1})'(1) = \frac{1}{2}}$$

2. (10 points) Evaluate the integral: $\int \frac{e^{2x}}{1 - e^{2x}} \, dx$.

Set $u = 1 - e^{2x}$

$\Rightarrow \quad du = -e^{2x} \cdot 2 \, dx$

$\Rightarrow \quad -\frac{1}{2} du = e^{2x} \, dx$

$\Rightarrow \int \frac{e^{2x}}{1 - e^{2x}} \, dx = \int \frac{-\frac{1}{2} du}{u} = -\frac{1}{2} \ln|u| + C$

$\qquad = -\frac{1}{2} \ln|1 - e^{2x}| + C$