Quiz #1 score______/30 **Name** Key
Math 236
Spring 2008

SHOW WORK

1. A) Justify that the function $f(x)=2x^5+x^3+3x+2$ has an inverse function on $\mathbb{R}$. 12 pts.

$f'(x) = \underbrace{10x^4+3x^2}_{\text{this is always } \geq 0} + 3 > 0$ on $\mathbb{R}$

so f is increasing on $\mathbb{R}$ $\Rightarrow$ f is 1-1 on $\mathbb{R}$
$\Rightarrow f^{-1}(x)$ exists

B) Find $(f^{-1})'(2)$. Hint: Recall that we showed $(f^{-1})'(x)=\dfrac{1}{f'(f^{-1}(x))}$ $\forall x \in R_f$ provided the denominator is not zero.

so $(f^{-1})'(2) = \dfrac{1}{f'(f^{-1}(2))} = \dfrac{1}{f'(0)} = \dfrac{1}{3}$

Note: $f(0)=2$ i.e., $(0,2)$ is on the graph of $y=f(x)$
$\Leftrightarrow f^{-1}(2)=0$ i.e., $(2,0)$ is on the graph of $y=f^{-1}(x)$.

ANSWER $(f^{-1})'(2)=$ $\boxed{\frac{1}{3}}$

2. Rewrite $2\ln(x+1)+\frac{1}{3}\ln x-\ln(\cos(x))$ as a single logarithm. 6 pts.

$= \ln(x+1)^2 + \ln x^{1/3} - \ln(\cos(x))$

$= \boxed{\ln\left(\dfrac{(x+1)^2 x^{1/3}}{\cos(x)}\right)}$

ANSWER ______________

3. A) Find the domain of $f(x)=\ln(\ln x)$ and compute $f'(x)$. 12 pts.

$f'(x) = \dfrac{1}{\ln x}\cdot\dfrac{1}{x}$

$D_f \Rightarrow \underbrace{\ln x > 0}_{x>1}$ and $x>0$

domain of $f=$ $\boxed{(1,\infty)}$ $f'(x)=$ $\boxed{\dfrac{1}{x\ln x}}$

B) Find $f'(x)$ for the function $f(x)=e^{-5x^2}$.

$f'(x) = e^{-5x^2}(-10x)$

$f'(x)=$ $\boxed{-10xe^{-5x^2}}$

C) Find the simplest exact value of $f(\ln(2))$ for the function $f(x)=e^x+3e^{-x}$.

$f(\ln(2)) = e^{\ln(2)} + 3e^{-\ln(2)}$

$= 2 + 3e^{\ln 2^{-1}}$

$f(\ln(2))=$ $\boxed{7/2}$

$= 2+3\cdot 2^{-1} = 2+3\cdot\frac{1}{2} = 2+\frac{3}{2} = \frac{4}{2}+\frac{3}{3} = \frac{7}{2}$