Quiz #6 score_____/35 **Name** Key
Math 232
Fall 2008

SHOW WORK where appropriate! NO CALCULATORS!!

1. Evaluate the following integrals. 15 pts.

a) $\int \frac{1}{x}\,dx$ = $\ln|x| + C$

b) $\int 2^x\,dx$ = $\frac{1}{\ln 2}2^x + C$

c) $\int \sin x\,dx$ = $-\cos x + C$

d) $\int \sec^2 x\,dx$ = $\tan x + C$

e) $\int \frac{1}{\sqrt{1-x^2}}\,dx$ = $\sin^{-1}(x) + C$

f) $\int (x^2-1)(3x+5)\,dx$ = $\int (3x^3+5x^2-3x-5)\,dx$

= $\frac{3}{4}x^4 + \frac{5}{3}x^3 - \frac{3}{2}x^2 - 5x + C$

2. a) $\int_{\pi/4}^{\pi/2} \csc x \cot x\,dx = -\csc(x)\Big|_{\pi/4}^{\pi/2}$

$= -(\csc(\pi/2) - \csc(\pi/4))$

$= -\left(\frac{1}{\sin(\pi/2)} - \frac{1}{\sin(\pi/4)}\right)$

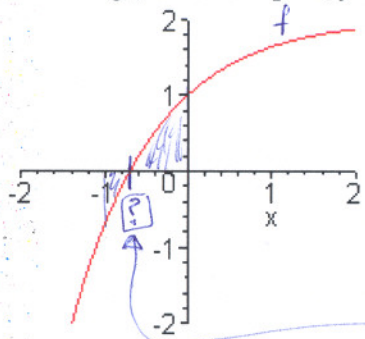
$= -\left(\frac{1}{1} - \frac{1}{1/\sqrt{2}}\right) = -1+\sqrt{2}.$

b) $\int_0^1 \frac{1}{1+x^2}\,dx = \tan^{-1}(x)\Big|_0^1$ 8 pts.

$= \tan^{-1}(1) - \tan^{-1}(0)$

$= \pi/4 - 0 = \pi/4$

3. Consider the function $f(x) = 2 - e^{-x}$ graphed below. Determine the definite integral(s) for each of the following ***(do not compute, just give the definite integrals (with the appropriate exact limits of integration!)*** : 8 pts.



a) The exact *signed area* between the graph of f and the x-axis on the interval $[-1, 0]$.

$\int_{-1}^{0} (2 - e^{-x})\,dx$

b) The exact *true area* between the graph of f and the x-axis on the interval $[-1, 0]$.

$\int_{-1}^{-\ln 2} -(2-e^{-x})\,dx + \int_{-\ln 2}^{0} (2-e^{-x})\,dx$

$f(x) = 2 - e^{-x} = 0$

$\Rightarrow 2 = e^{-x} \Rightarrow \ln 2 = -x \Rightarrow x = -\ln 2$

4. **True** or **(False)**: The function $A(x) = \int_0^x (3-t)\,dt$ is concave up. *Justify with calculus and then circle the correct answer above!!!!!* 4 pts.

$A'(x) = 3 - x$

$A''(x) = -1 < 0 \Rightarrow A(x)$ is concave down!