MA205 QUIZ 2 "Opportunity to Excel"

1) **Solve the following.**

a)

IF $g(r) = \int_a^r \frac{1}{s} + s^3 + 3s^5 + e^s \, ds$ $\Rightarrow g'(r) = \frac{1}{r} + r^3 + 3r^5 + e^r$

THEN $g'(0) =$ $e^0 = 1$

BECAUSE: FTC I

b)

IF $g(r) = \int_a^r \sin(y) + \cos(y) + e^y \, dy$ $g'(r) = \sin(r) + \cos(r) + e^r$

THEN $g'(\pi) =$ $\cancel{\sin(\pi)}^{0} + \cos(\pi) + e^{\pi} \Rightarrow \cos(\pi) + e^{\pi} = -1 + e^{\pi}$

BECAUSE: FTC I

2) **Solve the following. For definite integrals setup FTC II, but do not solve.**

$\int_{-3}^{-2} \frac{3}{\theta} + \frac{1}{\theta^2} \, d\theta$	$\ln\lvert(\theta)\rvert + \left(-\frac{1}{\theta}\right) \Big\rvert_{-3}^{-2}$
$\int_{-\pi}^{\pi} 5\sin(y) + \frac{\cos(y)}{4} \, ds$	$-5\cos(y) + \frac{\sin(y)}{4} \Big\rvert_{-\pi}^{\pi}$
$\int (4w + \sqrt{w} + x) \, dw$	$2w^2 + \frac{2}{3} w^{\frac{3}{2}} + xw + C$
$\int \left(\frac{e^s}{3} + \frac{2e^s}{5} + e^s\right) ds$	$\frac{e^s}{3} + \frac{2e^s}{5} + e^s \Big\rvert + C$

3) **What does "+C" mean when we solve for an indefinite integral?**

Shift on y-axis

Represents infinite values $\Rightarrow$ family of curves

MA205 Graded Homework #1 Due Tuesday 9 September 2008 IN-Class (25 Points)

Part A: Conceptual Knowledge (15 pts)-Neatness counts.

1) If $g(r) = \int_a^r v(t)dt$, in your own words describe what $g(r)$is if *v(t)* is the vertical velocity of an airborne yearling parachuting to the ground in feet per second and *t* is measured in seconds. Hint: We have only solved problems in 2-D, so use what we know!

   VERTICAL DISPLACEMENT

2) In your own words, describe the FTC I. Do not use formulas. Why is this important? Hint: Think of how +/-, ÷/× are related. RELATES DERIVATIVE / INTEGRAL ⇒ INVERSE OPS.

3) What is the difference between the Net Change Theorem and the Fundamental Theorem of Calculus part II? Provide an example. Hint: Go with your first instinct.

   CONCEPTUALLY 0. $F(b) - F(a)$

4) What is the difference between an indefinite and definite integral? What do we expect to get from each?

   Definite (a,b) ⇒ # amount of change Indefinite = function

5) If we found the anti-derivative of a function to be: $\sin(x) + C$. Answer the following: What does C represent? What do we need to find C? What does the complete anti-derivative $\sin(x) + C$ represent; provide a graphical example of this anti-derivative for three different values of C, you choose?

   Shift on y-axis, initial conditions ie $F(1)=5$, a family of curves or functions, graphs.

Part B Exercises (10 pts)

1) Suppose the velocity of a yearling on the land navigation course during ITP this summer is given by $v(t) = -(t^2 - 8t - 20)$ feet per second, where t=0 seconds as the yearling starts the navigation course. Determine the position function for any time *t* that determines the yearling's position for any time *t*. Then compute the total <u>distance</u> travelled after 20 seconds. Assume the land navigation course is unrealistic and there is no vertical displacement (2-D).

   $\int v(t)\,dt = -\frac{1}{3}t^3 + 4t^2 + 20t = s(t)$

   distance $= \int_0^{10} v(t)\,dt + \int_{10}^{20} |v(t)|\,dt = 1206'$

   $t^2 - 8t - 20 = 0$
   $(t-10)(t+2) = 0$
   $t = 10, -2$
   @ $t = 10$
   $\frac{+ \quad -}{10}$
   So distance ≠ disp.

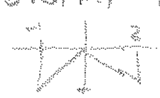
2) Solve the following by hand (confirm with Mathematica). Show all work!

   a. $\int e^{3-2r}\,dr$ $u = 3-2r$, $du = -2dr$ $\int e^u \frac{du}{-2} = -\frac{e^u}{2} + C$

   b. $\int_{-3}^{-2} \frac{3}{\theta} + \frac{1}{\theta^2} d\theta$ $3\ln|\theta| - \frac{1}{\theta}\Big|_{-3}^{-2} \Rightarrow 3\ln|-2| + \frac{1}{2} - (3\ln|-3| - \frac{1}{3})$

   c. $\int_{-\frac{\pi}{2}}^{\pi} \frac{4\cos(p)}{(\sin(p)+3)^2}\,dp$ $u = \sin(p)+3$, $du = \cos(p)\,dp$ $\int_{p=-\frac{\pi}{2}}^{p=\pi} \frac{4}{u^2}\,du = -\frac{4}{u}\Big|_{u=2}^{u=3} = -\frac{4}{3} + 2 = .667$

   d. $\int_{-1}^{2} (x - 2|(x)|)\,dx$ GRAPH 1ST

   $\int_{-1}^{0} x - 2|x|\,dx + \int_0^2 x - 2|x|\,dx$

   $\int_{-1}^{0} x - 2(-x)\,dx + \int_0^2 x - 2x\,dx$

   $\int_{-1}^{0} 3x\,dx + \int_0^2 -x\,dx = -3.5$ ANS

   e. $\int_0^{\frac{3\pi}{2}} |\sin(a)|\,da$

   $|-\cos(a)|\Big|_0^{\frac{3\pi}{2}}$

   $\int_0^{\pi} |\sin(a)|\,da + \int_{\pi}^{\frac{3\pi}{2}} |\sin(a)|\,da \Rightarrow |-\cos(a)|\Big|_0^{\pi} + |-\cos(a)|\Big|_{\pi}^{3\pi/2}$