Math 1B (7:30am – 8:20am)
Quiz 3 Version A
Fri Apr 23, 2010

SCORE: ___ / 30 POINTS

What month is your birthday ? ___ ___
What are the first 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your social security number ? ___ ___
[IF YOU DO NOT HAVE A SOCIAL SECURITY NUMBER, USE YOUR STUDENT ID NUMBER]

NO CALCULATORS ALLOWED
YOU MUST SHOW PROPER CALCULUS LEVEL WORK

State the definition of "definite integral". **[Same question and answer as quiz #2]** **SCORE: ___ / 2 POINTS**

THE DEFINITE INTEGRAL OF f ON $[a,b]$ IS
$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i^*)\Delta x$ WHERE $\Delta x = \frac{b-a}{n}$
AND $a+(i-1)\Delta x \le x_i^* \le a+i\Delta x$
IF THE LIMIT EXISTS

State the Fundamental Theorem of Calculus Part 2. **SCORE: ___ / 2 POINTS**

IF f IS CONTINUOUS ON $[a,b]$
AND F IS ANY ANTI-DERIVATIVE OF f
THEN $\int_a^b f(x)\,dx = F(b) - F(a)$

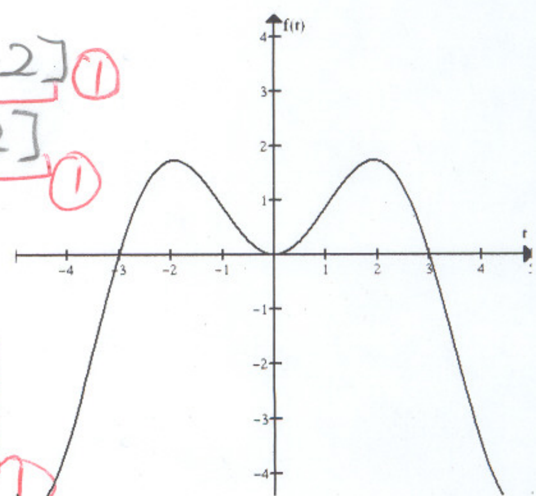
If $g(h)$ is the number of pounds you gained per inch you grew in height when you were h inches tall, and $g(h)$ **SCORE: ___ / 2 POINTS**
is measured in pounds per inch, what is the practical meaning of $\int_{36}^{42} g(h)\,dh = 25$? Give the units for each number in your answer.
Your answer should make sense to a 10 year old who has never heard of calculus before.

YOU GAINED 25 POUNDS WHEN YOU GREW FROM
36 INCHES TALL TO 42 INCHES TALL

The graph of f is shown below. Let $g(x) = \int_{-1}^{x} f(t)\,dt$. **SCORE: ___ / 6 POINTS**

[a] On what intervals is g concave up ? Explain briefly.

$g' = f$ IS INCREASING ON $[-\infty, -2]$ 1
1 1 AND $[0, 2]$ 1



[b] At what value(s) of x does g have a local minimum (minima) ?
Explain briefly.

$g' = f$ CHANGES FROM NEGATIVE TO POSITIVE 1
AT $x = -3$ 1

The velocity of an object at time t seconds is $v(t) = 6 - 3\sqrt{t}$ feet per second. Find the distance travelled by the object over the interval $[1, 9]$. **SCORE: ___ / 6 POINTS**

$6 - 3\sqrt{t} \geq 0$

$-3\sqrt{t} \geq -6$

$\sqrt{t} \leq 2$

$0 \leq t \leq 4$

$\int_1^9 |6 - 3\sqrt{t}|\, dt$

$= \int_1^4 (6 - 3\sqrt{t})\, dt + \int_4^9 -(6 - 3\sqrt{t})\, dt$ (1) (1)

$= (6t - 2t^{\frac{3}{2}})\Big|_1^4 - (6t - 2t^{\frac{3}{2}})\Big|_4^9$ (2)

$= [(24 - 16) - (6 - 2)] - [(54 - 54) - (24 - 16)]$ (1)

$= 4 - -8$

$= 12$ FEET (1) (1/2)

Suppose f' is continuous. If $f(2) = 7$ and $\int_{-1}^{2} f'(t)\, dt = 11$, find $f(-1)$. **SCORE: ___ / 2 POINTS**

$\int_{-1}^{2} f'(t)\, dt = f(2) - f(-1)$

$11 = 7 - f(-1)$

(1) IF YOU HAVE EITHER ONE,

$f(-1) = -4$ (1)

Find the derivative of the function $g(x) = \int_{\sqrt{x}}^{\ln x} \cos(1 + t^2)\, dt$. **SCORE: ___ / 5 POINTS**

$g'(x) = \frac{d}{dx} \int_{\sqrt{x}}^{\ln x} \cos(1 + t^2)\, dt$

$= \frac{d}{dx} \int_{\sqrt{x}}^{0} \cos(1 + t^2)\, dt + \frac{d}{dx} \int_{0}^{\ln x} \cos(1 + t^2)\, dt$ (1)

$= -\frac{d}{dx} \int_{0}^{\sqrt{x}} \cos(1 + t^2)\, dt + \frac{d}{dx} \int_{0}^{\ln x} \cos(1 + t^2)\, dt$ (1/2)

$= -\frac{d}{d\sqrt{x}} \int_{0}^{\sqrt{x}} \cos(1 + t^2)\, dt \cdot \frac{d\sqrt{x}}{dx} + \frac{d}{d\ln x} \int_{0}^{\ln x} \cos(1 + t^2)\, dt \cdot \frac{d \ln x}{dx}$

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

$= \frac{\cos(1 + \ln^2 x)}{x} - \frac{\cos(1 + x)}{2\sqrt{x}}$

Evaluate $\int \sec^7 x \tan x\, dx$. **SCORE: ___ / 5 POINTS**

(1) $u = \sec x$

$\frac{du}{dx} = \sec x \tan x$

(1) $du = \sec x \tan x\, dx$

$\int \sec^6 x \sec x \tan x\, dx$

$= \int u^6\, du$ (1)

$= \frac{1}{7} u^7 + C$ (1)

$= \frac{1}{7} \sec^7 x + C$ (1/2) (1/2)