University of Utah
Math 1220, Fall 2007
Name:

Solutions

Quiz # 1

Time: 15 minutes

In parts 2 and 3, please try to carefully explain the steps leading to your solution.

Part 1: (6 points) State the two parts of the Fundamental Theorem of Calculus.

1) If f is a continuous function, then:

$F(x) = \int_a^x f(t).dt$ is an antiderivative of f (for any choice of a)

2) If f is continuous on the interval $[a, b]$, and if F is any antiderivative of f, then: $\int_a^b f(t).dt = F(b) - F(a)$

Part 2: (8 points)
Evaluate the integral:

$$\int_0^1 \frac{x}{2-x^2}dx$$

Use the substitution: $u = 2 - x^2$; then $du = -2x\,dx$, and $u(0) = 2$, $u(1) = 1$

Thus: $\int_0^1 \frac{x}{2-x^2}dx = -\frac{1}{2}\int_0^1 \frac{-2x}{2-x^2}dx$

$= -\frac{1}{2}\int_2^1 \frac{du}{u} = -\frac{1}{2}\left[\ln|u|\right]_2^1 = -\frac{1}{2}(\ln 1 - \ln 2) = \frac{\ln 2}{2}$

Note: this is valid only because $2 - x^2 \neq 0$ for $x \in [0;1]$.

Part 3: (6 points)
Find the derivative of the function

$$f(x) = \ln(2 + \cos^2 x)$$

Use the chain rule:

$f'(x) = \frac{1}{2+\cos^2 x} \cdot (-2\sin x . \cos x)$