Mathematics 122

Quiz 29 Name:_____

You must show your work to get full credit.

Fundamental Theorem of Calculus. *Let F have a derivative on the interval $a \le b$. Then*

$$\int_a^b F'(x)\,dx = F(b) - F(a).$$

In words this is "The total change of F between a and b is the integral of the rate of change of F between a and b.

1. (a) If $F(x) = \dfrac{x^3}{3}$ find $F'(x)$. $F'(x) =$ x^2

(b) Use your answer to (a) and the Fundamental The of Calculus to compute the exact value of $\int_{-3}^{3} x^2\,dx = \int_{-3}^{3} F'(x)\,dx$

FTC $= F(3) - F(-3)$

$= \dfrac{(3)^3}{3} - \dfrac{(-3)^3}{3} = \dfrac{27+27}{3} = 9+9 = 18$

$\int_{-3}^{3} x^2\,dx =$ 18

2. (a) Use your calculator to compute $\int_1^3 \dfrac{dx}{x}$.

Math 9 fnInt $\int_1^3 (1/x)\,dx$

$\int_1^3 \dfrac{dx}{x} \approx$ 1.098612289

(b) If $F(x) = \ln(x)$ find $F'(x)$ $F'(x) =$ $\dfrac{1}{x}$

(c) Use the Fundamental Theorem for Calculus to find the exact value of $\int_1^3 \dfrac{dx}{x}$.

$\int_1^3 \dfrac{dx}{x} = \int_1^3 F'(x)\,dx = F(3) - F(1)$

$= \ln(3) - \ln(1)$

$= \ln(3) - 0$

$= \ln(3)$

$\int_1^3 \dfrac{dx}{x} =$ $\ln(3)$

Note:

$\ln(3) = 1.098611289$

so these agree