Mathematics 122

Quiz #34 Name: Key

You must show your work to get full credit.

The fundamental theorem of calculus is that if we have a function F with $F' = f$, then

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

The function F is called an ***anti-derivative*** or ***indefinite integral*** of f.

1. Find an anti-derivative of $f(x) = x^2$. *Hint:* It should be of the form $F(x) = cx^3$ where c is a constant.

$F(x) = \frac{1}{3}x^3$ works.

$F(x) =$ $\frac{1}{3}x3$

2. What is the exact value of $\int_1^4 x^2\,dx$?

Exact value is 21

$$\int_1^4 x^2\,dx = \int_1^4 f(x)\,dx = F(4) - F(1)$$
$$= \frac{4^3}{3} - \frac{1^3}{3}$$
$$= \frac{64-1}{3} = \frac{63}{3} = 21$$