

Instructions: Include all relevant work to get full credit. Write your solutions using proper notations. Encircle your final answers.

Quiz #18

1. State the Fundamental Theorem of Calculus - Part I.

[2]

If $f(x)$ is continuous on $[a, b]$, then

$$D_x \int_a^x f(t) dt = f(x), \text{ for } a \leq x \leq b.$$

2. Find the derivative of the following functions:

a. $F(x) = \int_0^x \frac{t^2}{1+t^3} dt \rightarrow F'(x) = \frac{x^2}{1+x^3}$ [1.5]

b. $g(x) = \int_x^1 \sqrt{t + \sin t} dt \rightarrow g(x) = - \int_1^x \sqrt{t + \sin t} dt$
 $= - \sqrt{x + \sin x}$ [1.5]

c. $y = \int_0^{x^3} \cos(t^2) dt \rightarrow y' = \cos[(x^3)^2] \cdot 3x^2$
 $= 3x^2 \cos(x^6)$ [2]

d. $g(x) = \int_{\sqrt{x}}^x \frac{e^t}{t} dt = \int_{\sqrt{x}}^c \frac{e^t}{t} dt + \int_c^x \frac{e^t}{t} dt$
 $= - \frac{e^{\sqrt{x}}}{\sqrt{x}} \cdot \frac{1}{2\sqrt{x}} + \frac{e^x}{x}$ [3]