Math 132 Quiz
8 AM - 9 AM

1. Use the minimum and maximum values of $f(x) = \sqrt{16 + x^2}$ on the interval $[-2, 3]$ to find numbers A and B such that $A \leq \int_{-2}^{3} f(x)\, dx \leq B$.

1^{st} derivative test :

$f'(x) = \frac{1}{2}(x^2+16)^{-1/2} \cdot 2x = \frac{x}{\sqrt{x^2+16}}$

$f'(x) = 0 \iff x = 0.$

So possible x-values to get max/min are 0, and the endpoints $-2, 3$

$f(0) = \sqrt{16} = 4$

$f(-2) = \sqrt{16+4} = \sqrt{20}$

$f(3) = \sqrt{16+9} = 5$

min = 4

max = 5

$A = \min \cdot (b-a) = 4(3 - -2) = 4 \cdot 5 = 20$

$B = \max \cdot (b-a) = 5(3 - -2) = 5 \cdot 5 = 25$

2. Suppose that $F(x) = \int_1^{x^3} \sqrt{9 + t + t^2}\, dt$. Calculate $F'(2)$.

Let $u = x^3$

$F'(x) = \frac{d}{du} \int_1^u \sqrt{9+t+t^2}\, dt \cdot \frac{du}{dx}$

$= \sqrt{9 + u + u^2} \cdot \frac{du}{dx}$

$= \sqrt{9 + x^3 + x^6} \cdot 3x^2$

$F'(2) = \sqrt{9 + 8 + 64} \cdot 3 \cdot 4$

$= \sqrt{81} \cdot 12 = 9 \cdot 12 = 108$