Name:
Sec. 5.2 – The definite integral
Math 251

1. Find the derivative of $\int_x^{x^2} e^{t^2}\,dt$

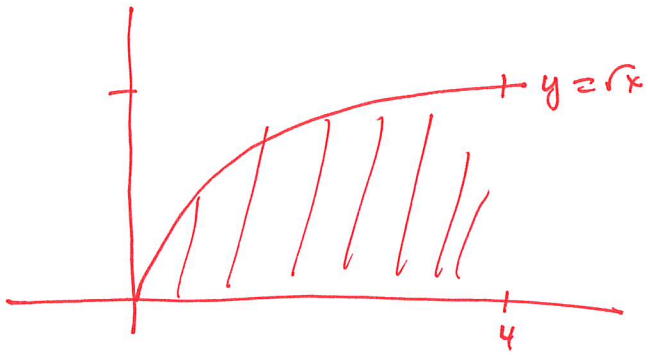
we have to use the chain Rule here

$$g(x) = \int_x^{x^2} e^{t^2}dt = \int_x^0 e^{t^2}dt + \int_0^{x^2} e^{t^2}dt = -\int_0^x e^{t^2}dt + \int_0^{x^2} e^{t^2}dt$$

$$g'(x) = -e^{x^2} + e^{(x^2)^2}\cdot\frac{d}{dx}(2x)$$

$$= -e^{x^2} + e^{x^4}\cdot 2x$$

2. Sketch the region enclosed by $y = \sqrt{x}, y = 0$ and $x = 4$ and calculate its area.



$$\text{Area} = \int_0^4 \sqrt{x}\,dx$$

Note Another FTC example

$$g(x) = \int_1^{\cos(x)} \sin(t^2)\,dt \quad \text{, by Chain Rule}$$

← This is not just x, so chain Rule!

→ replace t by cos(x)

$$g'(x) = \sin\left((\cos(x))^2\right)\cdot\frac{d}{dx}(\cos(x))$$

$$= \sin\left(\cos^2(x)\right)\left(-\sin(x)\right)$$

↑ take the derivative of the "function on the inside"