

Warm-Up Problems

January 27, 2003

- Let $f(x) = \sin(x)$.
 - Find a formula for $F(x) = \int_0^x f(t) dt$. (Notice the use of x and t .)
 - Find $F'(x)$. (**Solution:** $\sin x$)
- Let $f(x) = \sin(x)$.
 - Find a formula for $F(x) = \int_0^{x^2} f(u) du$.
 - Find $F'(x)$. (**Solution:** $2x \sin(x^2)$)
- Let $f(x) = \sin(x)$.
 - Find a formula for $F(x) = \int_x^0 f(z) dz$.
 - Find $F'(x)$. (**Solution:** $-\sin(x)$)
- Let $f(x) = \sin(x)$.
 - Find a formula for $F(x) = \int_{2x+1}^{-\pi} f(y) dy$.
 - Find $F'(x)$. (**Solution:** $-2 \sin(2x + 1)$)
- Let $f(x) = \sin(x)$.
 - Find a formula for $F(x) = \int_{2x}^{\tan x} f(r) dr$.
 - Find $F'(x)$. (**Solution:** $-2 \sin(2x) + (\sec^2 x) \sin(\tan x)$)

6. Compute:

$$\frac{d}{dx} \int_4^{x^3+2x} 4t + 1 dt$$

(**Solution:** $(3x^2 + 2)(4(x^3 + 2x) + 1)$)

7. Can you find the pattern? How about this one:

$$\frac{d}{dx} \int_0^x \sin(t^2) e^{t^2} dt$$

(**Solution:** $\sin(x^2) e^{x^2}$)

8. Can you find the pattern? How about this one:

$$\frac{d}{dx} \int_0^{3x-4x^2} \sin(t^2) e^{t^2} dt$$

(**Solution:** $(3 - 8x) \sin(x^2) e^{x^2}$)