DO NOW

pg 327; 44

$$\int_0^{\pi}(x+\sin x)\,dx$$

$$\left[\frac{x^2}{2}-\cos x\right]_0^{\pi}$$

$$\left(\frac{\pi^2}{2}-\cos\pi\right)-\left(\frac{0^2}{2}-\cos 0\right)$$

$$\frac{\pi^2}{2}+1+1$$

$$\frac{\pi^2}{2}+2$$

5.4 The Fundamental Theorem of Calculus - Day 3

pg 329; 88 (a) Integrate to find F as a function of x.
(b) Demonstrate the Second Fundamental Theorem of Calculus by differentiating the result of part a.

$$\int_0^x t(t^2+1)\,dt$$

$$\int_0^x (t^3+t)\,dt$$

$$\left[\frac{t^4}{4}+\frac{t^2}{2}\right]_0^x$$

a. $F(x)=\frac{x^4}{4}+\frac{x^2}{2}$

b. $F'(x)=x^3+x$

$x(x^2+1)$

$\therefore \frac{d}{dx}\left(\int_0^x t(t^2+1)\,dt\right)=x(x^2+1)$

pg 329; 80

Find F as a function of x and evaluate it at $x = 2$, $x = 5$, and $x = 8$.

$$\int_2^x (t^3+2t-2)\,dt$$

$$\left[\frac{1}{4}t^4+t^2-2t\right]_2^x$$

$$\left(\frac{1}{4}x^4+x^2-2x\right)-\left(\frac{1}{4}(2)^4+(2)^2-2(2)\right)$$

$F(x)=\frac{1}{4}x^4+x^2-2x-4$

$F(2)=\frac{1}{4}(2)^4+2^2-2(2)-4=\boxed{0}$

$F(5)=\frac{1}{4}(5)^4+25-10-4=\boxed{167.25}$

$F(8)=\frac{1}{4}(8)^4+64-16-4=\boxed{1068}$

HOMEWORK

pg 327 - 329; 12, 20, 26, 30, 32, 42, 60, 62, 79, 81, 87, 89