Sol

MATH 1A Worksheet(April 21st)

1. State two parts of Fundamental Theorem of Calculus, and briefly discuss what kind of problems we can solve using each part of FTC.

2. Find the derivative of following functions

   (a) $F(x) = \int_0^x \sin(t)dt$. $\sin(x)$

   (b) $F(x) = \int_{1000}^x \frac{1}{1+t^2}dt$. $\frac{1}{1+x^2}$

   (c) $F(x) = \int_0^{x+100} e^t dt$. e^{x+100}

   (d) $F(x) = \int_x^{x^2} (\arctan t)dt$ $\arctan(x^2)(2x) - \arctan(x)$

3. Find the value of the following definite integrals.

   (a) $\int_1^2 \cos x dx$. $\sin(2) - \sin(1)$

   (b) $\int_0^1 \frac{1}{1+x^2}dx$. $\pi/4$

   (c) $\int_{-100}^{100} x^3 dx$. $2(\frac{1}{4})(100)^4$

   (d) $\int_0^1 \sec^2 x dx$. $\tan(1) - \tan(0)$

4. Find the following limit by considering it as some definite integral.

$$\lim_{n\to+\infty} \frac{1}{n}(\sqrt{\frac{n}{1}} + \sqrt{\frac{n}{2}} + \ldots + \sqrt{\frac{n}{n-1}} + \sqrt{\frac{n}{n}}).$$

Δx $f(x_1)$ ... $f(x_n)$

$\int_0^1 1/\sqrt{x}\, dx = 2(1-0) = 2$