Fundamental Theorem

$$\int_a^b f(x)\,dx = F(x)\Big|_a^b$$

Y_1 = AntiDerivative $F(x)$

Lady G Revenue

$$\int_6^{13} f(x)\,dx = F(x)\Big|_6^{13}$$

$F(13) - F(6)$

$Y_1(13) - Y_1(6)$

Substitution

Ex

$u = x - 2$

$du = 1\,dx$

$x = u + 2$

$$\int_{u(0)}^{u(A)} (u+2)\sqrt[5]{u}\,du$$

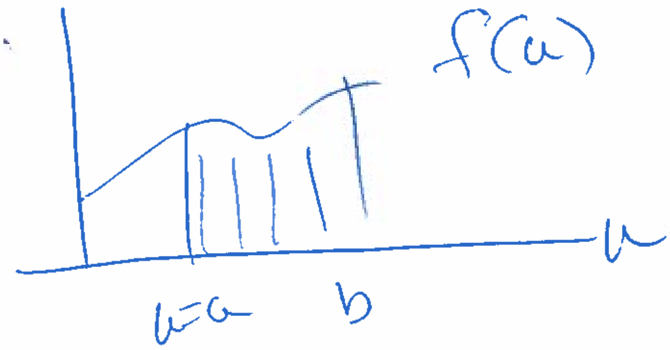
$$\downarrow$$

$$\int_{-2}^{A-2} (u+2)\,u^{1/5}\,du$$

$$\int_{-2}^{A-2} u^{6/5} + 2u^{1/5}\,du$$

$$\left.\frac{u^{11/5}}{11/5} + \frac{2u^{6/5}}{6/5}\right|_{-2}^{A-2}$$

$$\frac{5(A-2)^{11/5}}{11} + \frac{10(A-2)^{6/5}}{6}$$



Ex $\displaystyle\int_{x=3}^{5} \frac{\ln x}{x}\,dx$

$u = \ln x$

$du = \frac{1}{x}\,dx$

$u(5) = \ln 5$

$\displaystyle\int u\,du = \frac{u^2}{2}\Big|_{\ln 3}^{\ln 5}$

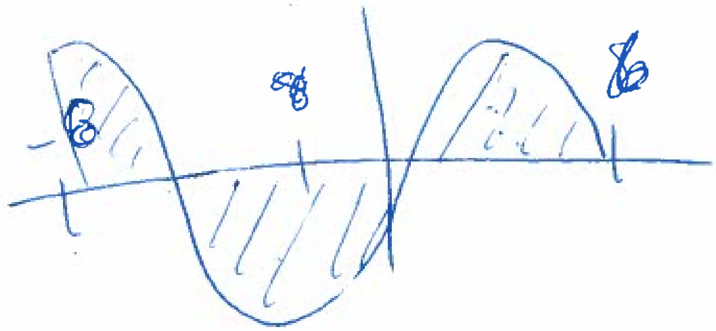
$u(x) = \ln(x)$ $\quad u(3) = u = \ln 3$

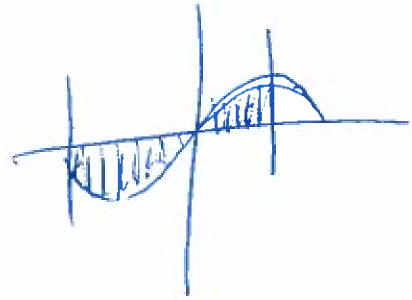
$= \frac{(\ln 5)^2}{2} - \frac{(\ln 3}{2}$

Area under a curve.

$= \#$

Ex $\displaystyle\int_{0}^{A} x\sqrt[5]{x-2}\,dx$





$$\int_b^a f(x)\,dx = -\int_a^b f(x)\,dx$$

$$F(a) - F(b) = -\left(F(b) - F(a)\right)$$

$$\int_a^a f(u)\,du = 0$$

Ex $$\int_{-2}^{2} x\sin(x^2)\,dx$$

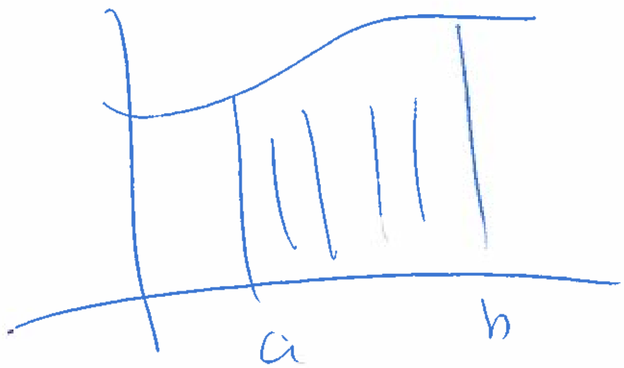
$u = x^2$

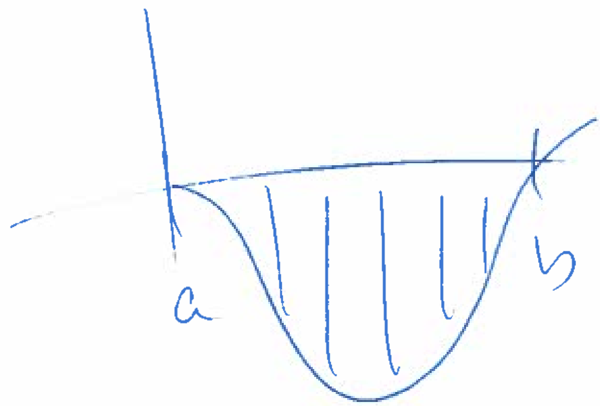
$du = 2x\,dx$

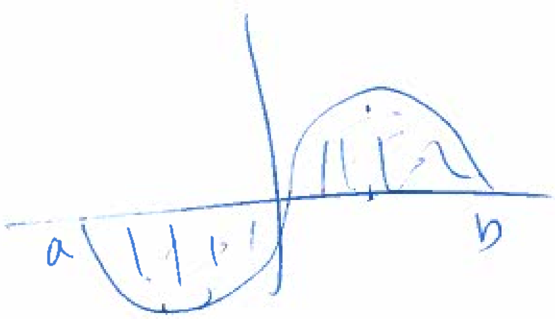
$u(2) = 4$

$u(-2) = 4$

$$\frac{1}{2}\int_4^4 \sin(u)\,du = 0$$







$$\int_a^b f(x)\,dx = 0$$

Not

$$\int_a^b |f(x)|\,dx$$

STAT EDIT

L1	L2

STAT CALC B: Logistic

Y_1 = VARS 5: >> 1:

$$Y = \frac{~~[illegible]~~ \ 2349}{1 + 11795e^{-.48}}$$

Calc Total Revenue

Calc: 7

Area =

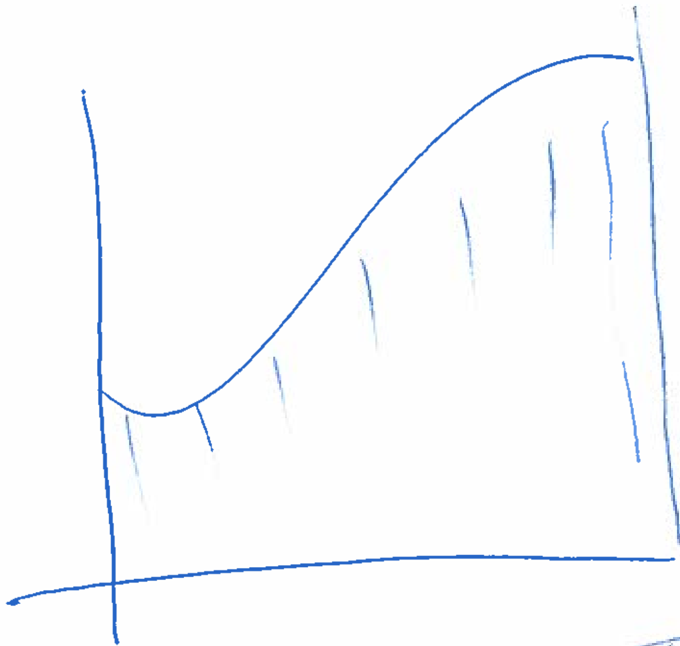
Lower: 6

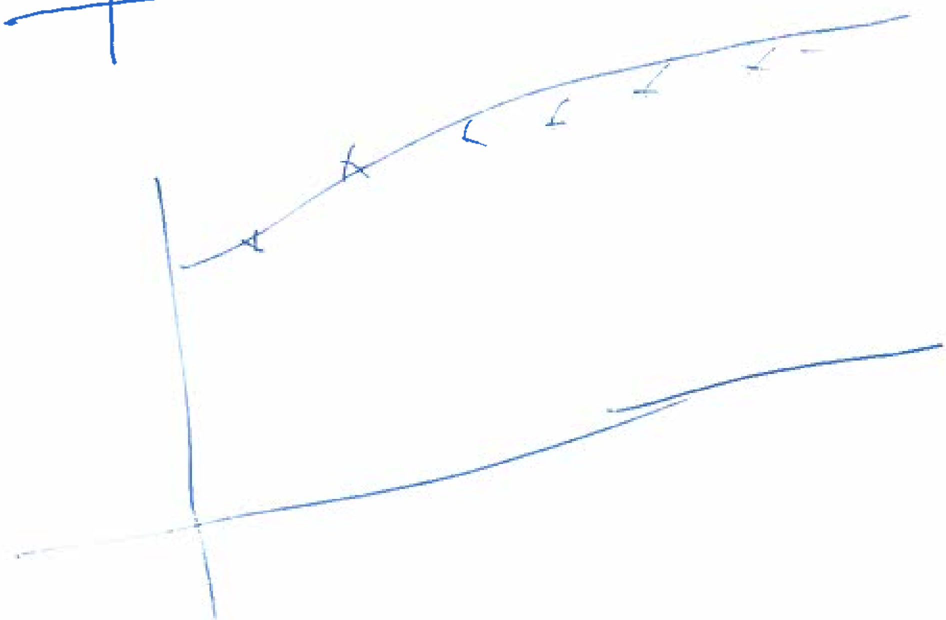
Upper: 13

Total $81.9 Billion

$$Y_1 = Ax^4 + Bx^3 + Cx^2 + Dx + E$$

$$\int Y_1 dx = Ax^5/5 + Bx^4/4 + \ldots$$





Ex $\displaystyle\int_1^2 x^2\sqrt{x^3+8}\,dx$

$$u = x^3+8$$
$$du = 3x^2\,dx$$
$$\frac{du}{3} = x^2\,dx$$

$$\int_{u(1)=9}^{u(2)=16} \sqrt{u}\,\frac{du}{3} \qquad u^{1/2}$$

$$= \frac{1\,u^{3/2}}{3\cdot 3/2}\Bigg|_9^{16}$$

$$= \frac{1}{3}\cdot\frac{2}{3}\cdot\left(16^{3/2} - 9^{3/2}\right)$$

Ex $\displaystyle\sum_{i=1}^{69} 6i - 1 = 6\sum_{i=1}^{69} i - \sum_{i=1}^{69} 1$

$$6\cdot\left[\frac{69\cdot 70}{2}\right] - 69$$

$$= 3\cdot 69\cdot 70 - 69$$

~~[illegible]~~ 14421

Ex $\displaystyle\int \frac{e^{6x}}{\sqrt{1-e^{12x}}}\,dx$

$$\int \frac{1}{\sqrt{1-u^2}}\,du = \sin^{-1}(x) + C$$

$u = e^{6x}$

$du = e^{6x} \cdot 6\,dx$

$\frac{du}{6} = e^{6x}\,dx$

$u^2 = e^{12x}$

$$\int \frac{1}{\sqrt{1-u^2}} \cdot \frac{du}{6}$$

$$\frac{1}{6}\int \frac{1}{\sqrt{1-u^2}}\,du$$

$$\frac{1}{6}\sin^{-1}(u) + C$$

Ans: $\frac{1}{6}\sin^{-1}(e^{6x}) + C$

$$\int_2^x t^2 - 8t + 9 \, dt$$

$$\frac{t^3}{3} - \frac{8t^2}{2} + 9t \Big|_2^x$$

$$f(x) = \frac{x^3}{3} - \frac{8x^2}{2} + 9x - \frac{2^3}{3} - \frac{8\,2^2}{2} + 9 \cdot 2$$

$$f'(x) = \underline{x^2 - 8x + 9} \qquad 0 \qquad 0 \qquad 0$$

Last Time

Substitution.

Ex $\int x \sin(x^2)\,dx$

$u = x^2$

$du = 2x\,dx$

$\frac{du}{2} = x\,dx$

$\int \sin(u) \frac{du}{2}$

$\frac{1}{2}\int \sin(u)\,du$

$-\frac{1}{2}\cos(u) + C$

Answer: $-\frac{1}{2}\cos(x^2) + C$

This Time

$$\int_a^b f(u)\,du = F(b) - F(a)$$

or $F(u)\Big|_a^b$