19.

0	0
.001	40 ←
.002	62
.003	82
.004	

LRAM

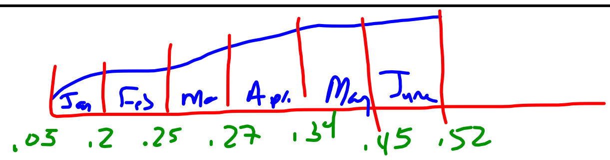
$(.001)(0) + (.001)(40) + (.001)(62) + \dots$

a. .984 m

b. .492

$(.001)(0) + (.001)(40) +$

29.



Jan		Feb.	Mar.	Apr.
.05	.2	.25	.27	.34

Upper:

$30(.2 + .25 + .27 + .34 + .45 + .52)$

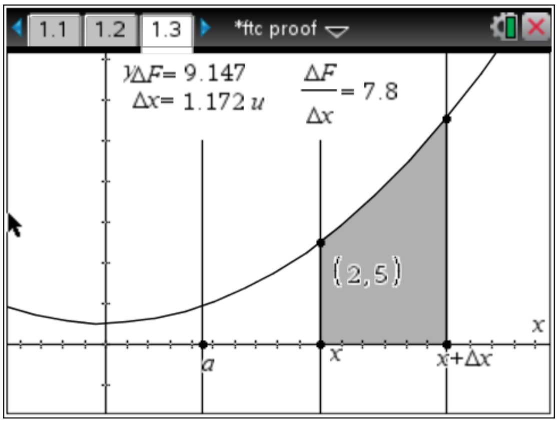
Lower

$30(.05 + .2 + .25 + .27 + .34 + .45)$

5.4a Fundamental Theorem of Calculus (FTC)

$$F(x) = \int_a^x f(t)\,dt$$

area under $f(t)$ from a to x



$$\lim_{\Delta x \to 0} \frac{\Delta F}{\Delta x} = f(x)$$

$$\lim_{\Delta x \to 0} \frac{F(x+\Delta x) - F(x)}{\Delta x} = f(x)$$

$$F'(x) = f(x) \qquad \text{F.T.C.}$$

State both parts of the Fundamental Theorem of Calculus

$$F(x) = \int_a^x f(t)\,dt$$

I. $$F'(x) = f(x)$$

$$\frac{d}{dx}\left(\int_a^x f(t)\,dt\right) = f(x)$$

$$\frac{d}{dx}\left(\int_0^x t^3\,dt\right) = x^3$$

II. $$\int_a^b f(x)\,dx = F(b) - F(a)$$

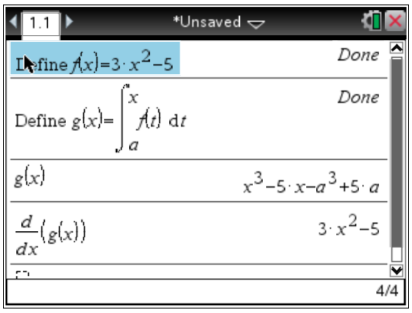
On a calculator page:

Define $f(x) = 3x^2 - 5$

Define $g(x) = \int_a^x f(t)dt$

g(x)

$\frac{d}{dx}(g(x))$



how does this support the FTC?

Evaluate the following definite integrals. Support your answer with Nspire.

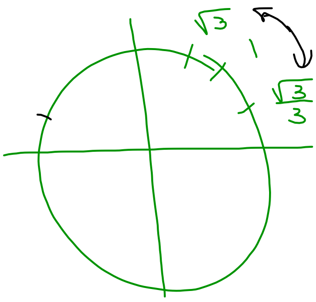
$$\int_0^5 \left(x^{\frac{3}{2}}\right)dx = \frac{2}{5}x^{\frac{5}{2}}\Big|_0^5 = \frac{2}{\cancel{5}}\left(5^{\cancel{\frac{5}{2}}\,\frac{3}{2}}\right) - \cancel{\frac{2}{5}(0)^{\frac{5}{2}}}$$

$$2\left(5^{\frac{3}{2}}\right)$$

$$10(5)^{\frac{1}{2}} = 10\sqrt{5}$$

$$\int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} \left(\csc^2\theta\right)d\theta = -\cot\theta\Big|_{\frac{\pi}{6}}^{\frac{5\pi}{6}}$$

$$-\cot\left(\frac{5\pi}{6}\right) - \left(-\cot\frac{\pi}{6}\right)$$



$$+(+\sqrt{3}) + (+\sqrt{3})$$

$$\sqrt{3} + \sqrt{3}$$

$$2\sqrt{3}$$

total area vs. net area

what are the differences/similarities?

how do I calculate total area?

Total on Calc. $= \int_a^b |f(x)|\,dx$

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

Total by hand $= \int_a^b f(x)\,dx + \left| \int_b^c f(x)\,dx \right|$

b is the x inter. when f(x) changes sign.

Find the total area of the region between the curve and the x-axis.

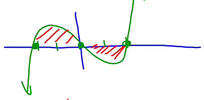
$y = x^3 - 4x, \ -2 \le x \le 2$

$x^3 - 4x = 0$

$x(x^2 - 4) = 0$

$x = 0 \quad x^2 - 4 = 0$

$x = 0, \pm 2$



$\int_{-2}^{0} (x^3 - 4x)\,dx + \left| \int_{0}^{2} (x^3 - 4x)\,dx \right|$

$2 \int_{-2}^{0} (x^3 - 4x)\,dx$

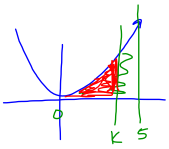
$2 \left(\frac{x^4}{4} - 2x^2 \right) \Big|_{-2}^{0}$

$2\left((0-0) - (4-8) \right)$

$2(4)$

8

Find the value of k so that the line x = k divides the area under $y = x^2$ from $0 \le x \le 5$ in half.



$$\int_0^k x^2\,dx = \int_k^5 x^2\,dx$$

$$\left.\frac{x^3}{3}\right|_0^k = \left.\frac{x^3}{3}\right|_k^5$$

$$\frac{k^3}{3} - 0 = \frac{5^3}{3} - \frac{k^3}{3}$$

$$\frac{2}{3}k^3 = \frac{5^3}{3}$$

$$\cancel{2}k^3 = \frac{5^3}{2}$$

$$\sqrt[3]{k^3} = \sqrt[3]{\frac{5^3}{2}}$$

$$k = \frac{5}{\sqrt[3]{2}}$$

$$k = 3.968$$