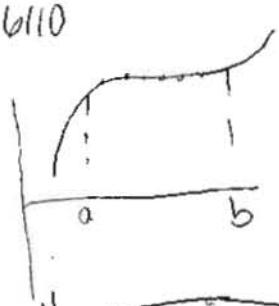
1/6/10




$$\sum_{i=1}^{N} \sqrt{1+\left(\frac{\Delta y}{\Delta x}\right)^2}\,\Delta x$$

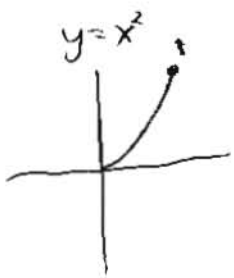
$$\lim_{\|\Delta\|\to 0} \sum_{i=1}^{N} \sqrt{1+\left(\frac{\Delta y}{\Delta x_i}\right)^2}\,\Delta x_i$$

$$\sum_{i=1}^{N} \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

$$\int_a^b \sqrt{1+[f'(x)]^2}$$

$$\sum_{i=1}^{N} \sqrt{(\Delta x)^2+(\Delta y)^2}$$

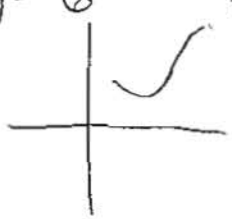
ex: $y = x^2$



$$\int_0^1 \sqrt{1+(2x)^2}\,dx$$

* can't integrate yet

$y = \frac{1}{6}x^3 + \frac{1}{2x}$ $\left[\frac{1}{2}, 2\right]$ ← funny-looking function, so prob. works out



$$\int_{1/2}^{2} \sqrt{1+\left(\frac{x^2}{2}-\frac{1}{2x^2}\right)^2}\,dx$$

$$\int_{1/2}^{2} \sqrt{1+\frac{x^4}{4}-\frac{1}{2}+\frac{1}{4x^4}}\,dx$$

$$\int_{1/2}^{2} \sqrt{\frac{x^4}{4}+\frac{1}{2}+\frac{1}{4x^4}}$$

$$\int_{1/2}^{2} \sqrt{\left(\frac{x^2}{2}+\frac{1}{2x^2}\right)^2}\,dx$$

$$\int_{1/2}^{2} \left(\frac{x^2}{2}+\frac{1}{2x^2}\right)dx$$

$$\frac{x^3}{6}-\frac{1}{2x}\Big]_{1/2}^{2}$$

$$\left(\frac{8}{6}-\frac{1}{4}\right)-\left(\frac{1}{48}-1\right)$$

$$= \boxed{\frac{33}{16}}$$

$y = \ln(\cos x)$ ← strange, so prob. will work out

$[0, \pi/4]$

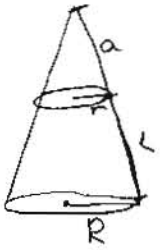
$$\int_0^{\pi/4} \sqrt{1+\left(\frac{-\sin x}{\cos x}\right)^2}\,dx$$

$$\int_0^{\pi/4} \sqrt{1+\tan^2 x}\,dx$$

$$\int_0^{\pi/4} \sec x\,dx$$

$$\ln|\sec x+\tan x|\Big]_0^{\pi/4}$$

$$\ln(\sqrt{2}+1)-\ln(1+0)$$




Lateral area of frustrum = ?

lateral area = $\pi r \ell$

$\pi R(a+\ell) - \pi r a$

$\pi(Ra + R\ell - ra)$

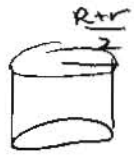
$\pi(\ell r + R\ell)$

$\pi \ell (r + R)$

$\frac{a}{r} = \frac{a+\ell}{R}$

$aR = ar + \ell r$

$aR - ar = \ell r$





$2\pi r h$

$2\pi \ell \left(\frac{R+r}{2}\right)$

$\pi \ell (R+r)$

$\pi \ell (r+R)$

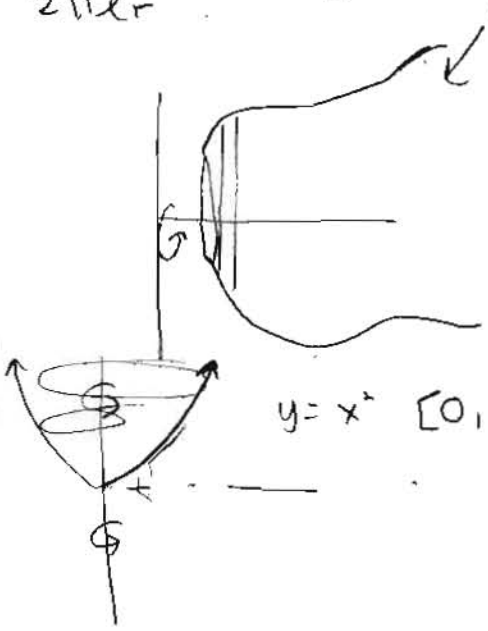
$\pi \ell (r_1 + r_2)$ $\quad \frac{r_1 + r_2}{2} = r$

$2\pi \ell r$

most work out

$$2\pi \int_a^b f(x)\sqrt{1+[f'(x)]^2}\,dx$$

frustrum!



$y = x^2 \quad [0,1]$

whole is arclength

$$2\pi \int_0^1 (x)\sqrt{1+(2x)^2}\,dx$$

$$\frac{\pi}{4}\cdot\frac{2}{3}(1+4x^2)^{3/2}\Big]_0^1$$

$$\frac{\pi}{6}(5^{3/2}-1)$$