$\rho = 10\ kg/m$

$W = F \cdot d \cdot y$

$= mgy \qquad \rho dy$

$$W = \int_{50}^{55} \rho dy\, g\, y$$

$$= \rho g \int_{50}^{55} y\, dy$$

$$= \rho g \left[\frac{y^2}{2}\right]_{50}^{55} = \frac{10}{2} g \left[3025 - 2500\right]$$

$$= 5g \cdot 525$$

$$= 2625g$$

$m_{rock} = 2000$

$m_{fuel} = 4000$

$m_{total} = 6000 - h$

$W = \int F\, dy \qquad mg \qquad \rho dh$

$$= g \int_0^{2000} (6000 - h)\, dh$$

$$= g \left(6000h - \frac{h^2}{2}\right)_0^{2000}$$

$$= g \left(12000000 - \frac{4000000}{2}\right)$$

$$= g \cdot 10{,}000000$$

$\int \frac{x+7}{x^2+4x+8}\,dx \Rightarrow A\ln|x^2+4x+8| + B\arctan\left(\frac{x+2}{2}\right)$

$\boxed{A+B}$

$= \int \frac{x+7}{x^2+4x+4+4}\,dx$

$= \int \frac{x+7}{(x+2)^2+2^2}\,dx$

$= \int \frac{x+2}{(x+2)^2+2^2} + \frac{5}{(x+2)^2+2^2}\,dx$

$\frac{5}{2}\arctan\left(\frac{x+2}{2}\right)$

let $x+2 = 2\tan\theta$

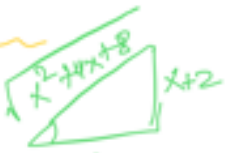
$dx = 2\sec^2\theta\,d\theta$

$= \int \frac{2\tan\theta \cdot 2\sec^2\theta\,d\theta}{2^2\tan^2\theta + 2^2} + \frac{5}{2}\arctan\left(\frac{x+2}{2}\right)$

$= \int \frac{2\tan\theta\,\sec^2\theta}{4(\sec^2\theta)}\,d\theta + \frac{5}{2}\arctan\left(\frac{x+2}{2}\right)$

$= \ln|\sec\theta| + \frac{5}{2}\arctan\left(\frac{x+2}{2}\right)$

$= \ln\left|\frac{\sqrt{x^2+4x+8}}{2}\right| +$



$= \ln\sqrt{x^2+4x+8} - \ln 2 + \frac{5}{2}\arctan\left(\frac{x+2}{2}\right)$

$= \ln(x^2+4x+8)^{1/2} + \frac{5}{2}\arctan\left(\frac{x+2}{2}\right)$

$= \frac{1}{2}\ln(x^2+4x+8) + \frac{5}{2}\arctan\left(\frac{x+2}{2}\right)$

A $\qquad$ B

$A+B = \frac{1}{2} + \frac{5}{2} = \frac{6}{2} = 3$

$\int \frac{8x^2}{x^4-16}\,dx$ (which term appears on sol^n)

$= \int \frac{8x^2}{(x^2-4)(x^2+4)}\,dx$

$= \int \frac{8x^2}{}$

$\int (x-2)(x+2)(x^2+4)$

$= \frac{A}{x-2} + \frac{B}{x+2} + \frac{Cx+D}{x^2+4} \to 2^2$

$\ln|x-2| + B\ln|x+2| + \frac{4}{2}\arctan\left(\frac{x}{2}\right)$

$\Rightarrow 2\arctan\left(\frac{x}{2}\right)$

$\frac{2x+2}{x^2+4} = \int \frac{2x}{x^2+4}dx + \int \frac{2}{x^2+4}$

$\int \frac{1}{(4x-x^2)^{3/2}}dx$

$= \int \frac{1}{(-(x^2-4x+4-4))^{3/2}}dx$

$= \int \frac{1}{(4-(x-2)^2)^{3/2}}dx$

$= \int \frac{1}{(2^2-(x-2)^2)^{3/2}}dx$

$x-2 = 2\sin\theta$

$dx = 2\cos\theta\, d\theta$

$= \int \frac{2\cos\theta\, d\theta}{(4-4\sin^2\theta)^{3/2}}$

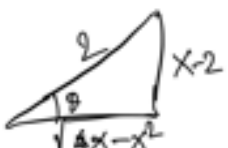
$= \int \frac{2\cos\theta\, d\theta}{(4\cos^2\theta)^{3/2}}$

$= \int \frac{2\cos\theta\, d\theta}{(2\cos\theta)^{2\cdot 3/2}}$

$= \int \frac{2\cos\theta}{4\cos^3\theta}d\theta$

$= \frac{1}{4}\int \frac{1}{\cos^2\theta}d\theta$

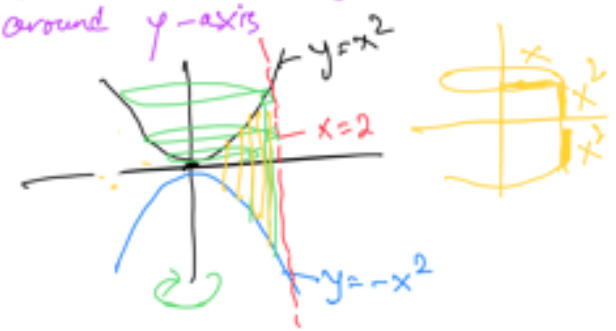
$= \frac{1}{4}\tan\theta + C$



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

V. of shape created by revolving

region bet^n $y=x^2$, $y=-x^2$, $x=2$
around y-axis



$$V = 2\pi \int_0^2 r\,h \cdot dx$$

$$= 2\pi \int_0^2 x \cdot 2x^2\,dx$$

$$= 2\pi \cdot \int_0^2 2x^3\,dx$$

$$= 2\pi \cdot \frac{2x^4}{4}\Big|_0^2$$

$$= \cancel{4}\pi \cdot \frac{2^4}{\cancel{4}} - 0$$

$$= 16\pi$$

dy

$$\rho = \frac{m}{\cancel{dh}} \qquad \boxed{m = \rho\,dh}$$

Mg

$F\,dx$


∫F dx
2πrh

- ○
- ○