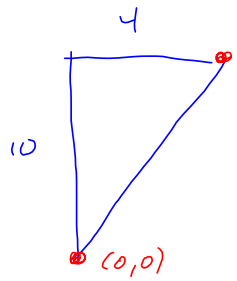
Example from Notes.



$m = \frac{10-0}{4-0} = \frac{10}{4} = \frac{5}{2}$

$y = m(x-x_1)+y_1$

$= \frac{5}{2}(x-0)+0 = \frac{5}{2}x = y$

$x = \frac{2}{5}y = r_i$

$\frac{1000\,kg}{m^3}$ = Density of water @ STP.

$F = ma = mg$

$W = F \cdot D$

$g = 9.8\,m/s^2$

$\left(\frac{2}{5}y^2\right)\,m^2$

$(10-y)\,m$

$$\int_0^{10} \left(1000\,\frac{kg}{m^3}\right)\left(9.8\,\frac{m}{s^2}\right)\left(\pi\left(\frac{2}{5}y\right)^2\right)\left(m^2\right)(10-y)(m)\,dy\,(m)$$

$= \frac{kg \cdot m^2}{s^2} = \frac{kg\,m}{s^2} \cdot m$

Dimensional Analysis.

What are the units?

$= (1000)(9.8)(\pi)\left(\frac{4}{25}\right)\int_0^{10} y^2(10-y)\,dy$

$= \text{stuff}\int_0^{10}(10y^2-y^3)\,dy = \text{STUFF}\left[\frac{10y^3}{3}-\frac{y^4}{4}\right]_0^{10}$

$= (\text{STUFF})\left(\frac{10(10)^3}{3}-\frac{10^4}{4}\right) = \text{STUFF}\left(\frac{4\cdot 10^4 - 3\cdot 10^4}{12}\right)$

$= 10^4(\text{STUFF})\left(\frac{1}{12}\right) = AAAAUGH!$

$F = 5x^{-2}$ from $x = 1$ to $x = 14$

x = distance from orig in (ft)

$$\int_1^{14} 5x^{-2}\,dx$$

A cable that weighs 8 lb/ft is used to lift 600 lb of coal up a mine shaft 300 ft deep. Find the work done.

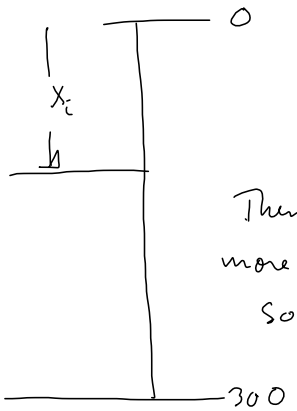
Show how to approximate the required work by a Riemann sum. (Let x be the distance in feet below the top of the shaft. Enter x_i^* as x_i.)

Express the work as an integral. Evaluate the integral.

#15 in Text.

Find Work = W in ft-lbs. Ugh! Always upside-down!

But OK.



The weight of chain decreases.

Starts @ $(8\ lb/ft)(300\ ft) = 2400\ lbs$.

Then decreases to 0 when done & no more chain is out.

So, $x=300 \rightarrow y = 2400$

$x=0 \rightarrow y = 0$

$(0,0), (300, 2400)$

FORCE = WEIGHT:

$m = \frac{2400}{300}$ $y = 8(x-0)+0 = 8x$

= weight of chain as function of how deep it is.

$F = 8x$, Now, what distance is it lifted?

x

So $F \cdot D = 8x \cdot x$? $= 8x^2$

Lift the bucket a small amount.

$8x \cdot \Delta x$

$F \cdot D$

$\sum_{i=1}^{} (8x_i)\Delta x$

$$\int_0^{300} 8x\,dx = 4x^2\Big]_0^{300} = 4(300)^2 = (90000)(4)$$

$$= 360{,}000 \text{ ft-lbs}$$

PLUS the weight of the coal times distance

$(600\ lbs)(300\ ft)$

$= 180{,}000$ ft-lbs, so

$360{,}000 + 180{,}000 = 540{,}000$ ft-lbs

$$\int_0^{300} (-8y + 3000)\, dy$$

$$= \left[-\frac{8y^2}{2} + 3000y \right]_0^{300}$$

$$= -4(300)^2 + 3000(300)$$

$$= -4(90000)$$

$$= -360{,}000 + 900{,}000$$

$$= 540{,}000$$

Finishing Writing Test 4 ReDo, today - will send it to Testing and e-mail you when it's ready. Will leave it open until Monday for you.