December 2, 2025

National Mutt Day

Today in History:

Enron flies for bankruptcy (2001)

Monroe Doctrine declared (1823)

Number of the Day: 1794

1794 = 2 x 3 x 13 x 23

1794 is a nonagonal number.

Fun Fact:

Thirty-five percent of the people who use personal ads for dating are already married.

Quote of the Day:

"They (mothers-in-laws) never leave when they say they will. When my mother-in-law visits, the mice throw themselves at the cat, begging to be eaten."

— Lisa Kleypas

Today's Weather:

Cloudy with snow. High 33°.

Math 121 - Quiz #47

For the volume obtained if the region bounded by

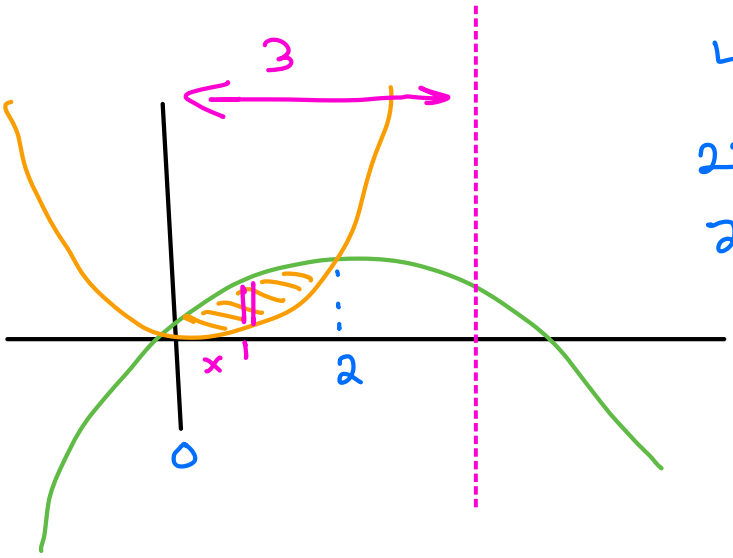
$$f(x) = 4x - x^2 \qquad \text{and} \qquad g(x) = x^2$$

is rotated about the line $x = 3$. Fill in the boxes. (You do not need to solve the integral).

$$V = \int_{\boxed{0}}^{\boxed{2}} 2\pi \left(\boxed{3-x}\right) \left[\left(\boxed{4x-x^2}\right) - \left(\boxed{x^2}\right)\right] \, dx$$

R

h



$4x - x^2 = x^2$

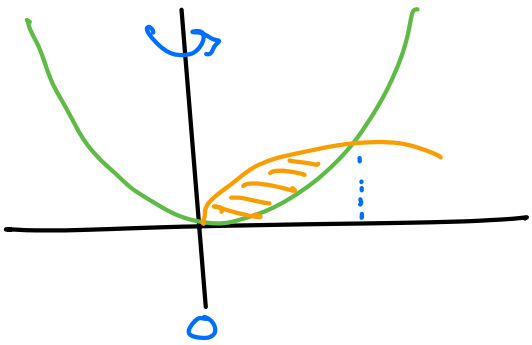
$2x^2 - 4x = 0$

$2x(x-2) = 0$

$x = 0, 2$

$R = 3 - x$

Pg 390 #15 $y = \frac{1}{2}x^2$ $y = \sin(x^2)$



$$V = \int_a^b 2\pi x \left(\sin(x^2) - \frac{1}{2}x^2\right) dx$$

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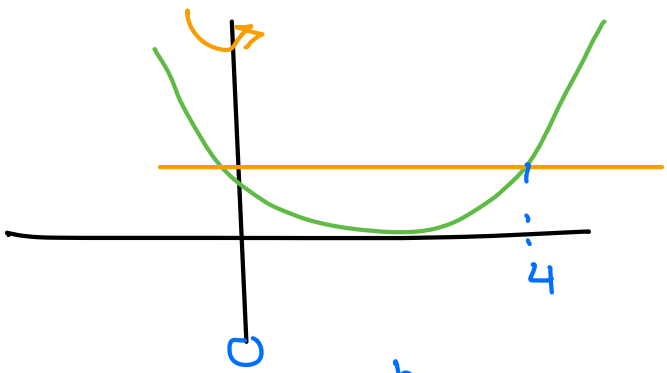
mpod #5 $y = \frac{1}{2}(x-2)^2$ $y = 2$

y-Axis



$$V = \int_a^b 2\pi r h \, dx$$

$$= \int_0^4 2\pi x \left(2 - \frac{1}{2}(x-2)^2\right) dx$$

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

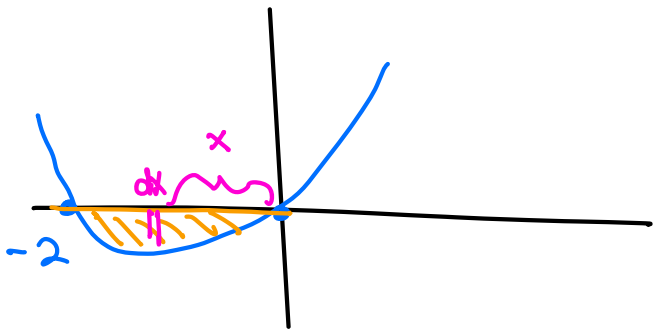
$$4 = (x-2)^2$$

$$\pm 2 = x - 2$$

$$x = 0, 4$$

#4 $y = 2x^2 + 4x$ $y = 0$ y-AXIS

$y = 2x(x+2)$

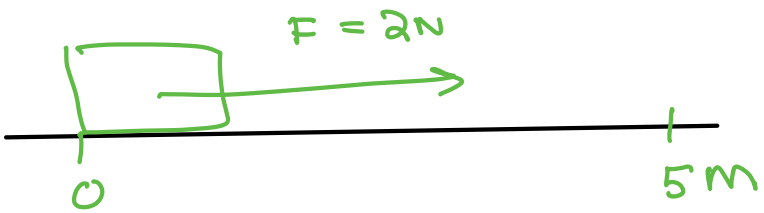


$$V = \int_a^b 2\pi r h \, dx$$

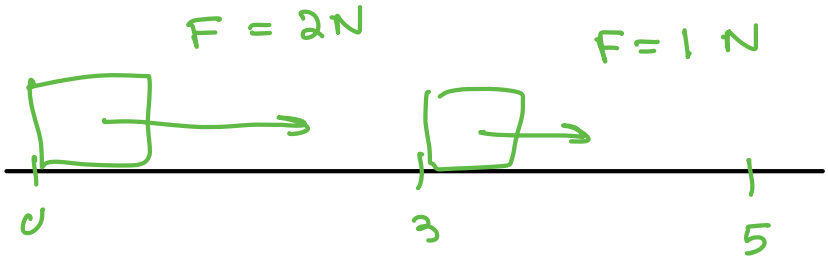
$$= \int_{-2}^{0} 2\pi (-x)(0 - (2x^2 + 4x)) \, dx$$

WORK

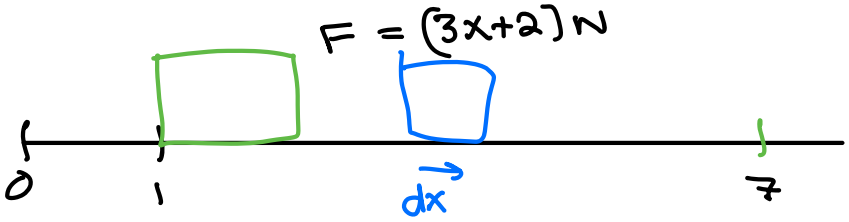
WORK = FORCE · DISTANCE



$W = F \cdot d = (2N)(5M) = 10 N \cdot M$



$(2N)(3M) + (1N)(2M) = 8 N \cdot M$



$$W = F \cdot d$$

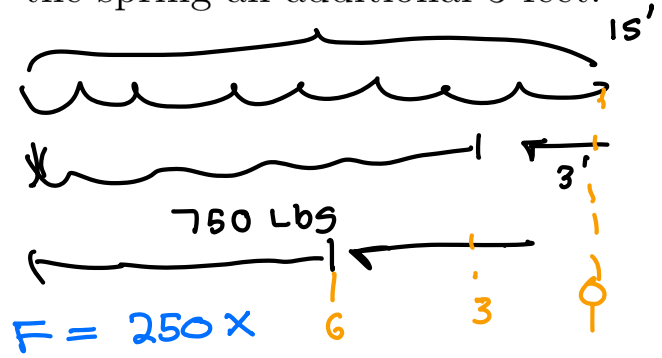
$$W = (3x+2)\,dx$$

$$W = \int_1^7 (3x+2)\,dx = \frac{3x^2}{2} + 2x \Big|_1^7$$

$$= \left(\frac{3(49)}{2} + 14\right) - \left(\frac{3}{2} + 2\right)$$

$$= 84 \text{ N} \cdot \text{M}$$

A force of 750 pounds compresses a spring 3 feet from its natural length of 15 feet. Find the work done in compressing the spring an additional 3 feet.



HOOKS LAW

$F = Kx$

$750 = K(3)$

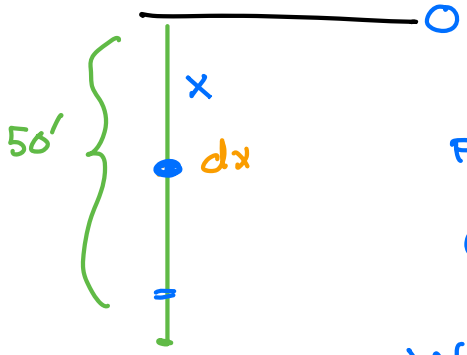
$K = \frac{750}{3} = 250$

$$W = \int F \cdot d = \int_3^6 (250x)\,dx$$

$$= 125x^2 \Big|_3^6 = 125(36 - 9)$$

$$= 3375 \text{ FT} \cdot \text{LBS}$$

A 50-ft chain weighing 2 lb/ft is attached to a drum hung from the ceiling. The ceiling is high enough so that the free end of the chain does not touch the floor. How much work is required to wind the chain around the drum?



$F = F \cdot d$

$F = \text{WEIGHT CHAIN} = 2\,\text{Lb/ft} \cdot dx$

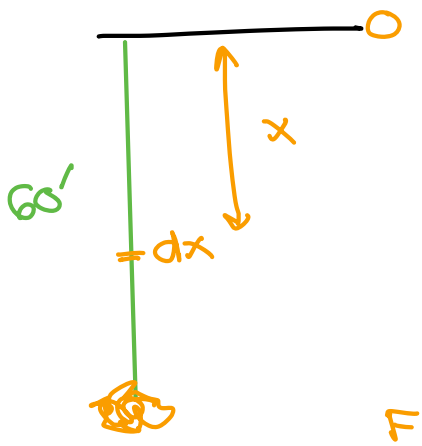
$d = x$

$W = \overbrace{2 \cdot dx}^{F} \cdot \overbrace{x}^{d}$

$W = \int_0^{50} 2x\,dx = x^2 \Big|_0^{50}$

2500 ft·Lbs

A worker pulls a 50-lb motor from ground level to the top of a 60-ft-high building using a rope that weights $\frac{1}{4}$ lb/ft. Find the work done.



$W = W_{\text{MOTOR}} + W_{\text{ROPE}}$

$= \text{WEIGHT}_{\text{MOTOR}} \cdot \text{DIST} +$

$(50\,\text{Lbs})(60\,\text{ft})$

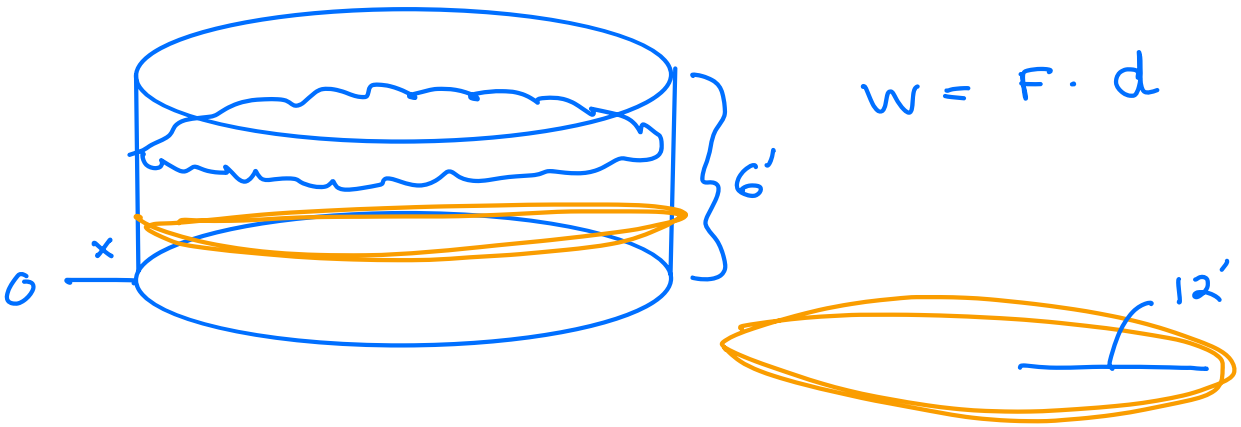
$F = \text{WEIGHT} = \frac{1}{4}\,dx$

$d = x$

$W_{\text{ROPE}} = \int_0^{60} \frac{1}{4} x\,dx = \frac{x^2}{8}\Big|_0^{60} = \frac{3600}{8}$

$$W = \underbrace{3000}_{\text{MOTOR}} + \underbrace{450}_{\text{ROPE}} = 3450 \text{ Lb} \cdot \text{ft}$$

A pool, circular in shape with 12 foot radius and 6 feet deep, is 2/3 filled with water. Find the work needed to pump all the water out of the pool. The density of water is 62.4 lb/ft^3.



$W = F \cdot d$

$F = \text{WEIGHT} = \text{VOLUME} \cdot \text{DENSITY}$

$= \pi (12)^2 dx \cdot (62.4)$

$d = 6 - x$

$$W = \int_0^4 \pi (12)^2 (62.4)(6 - x)\, dx$$

$= 451{,}665 \text{ Lb-ft}$