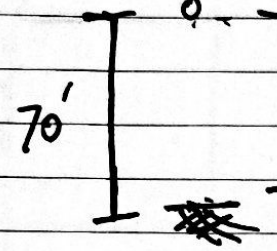
Date 3/30/26 M T W T F S S

Problem of the Day 71

A Ball is dropped 70 feet how long does it take to hit the ground?



Use,

$$x - x_0 = v_0 t + \frac{1}{2} a t^2$$

What we have

$x = 70'$
$x_0 = 0'$
$v_0 = 0$
$t = ?$
$a = 32.2$
$t = ?$

x will be in the y direction

Plug into equations!

$$70 - 0 = 0 \cdot t + \frac{1}{2}(32.2)\, t^2$$

$$70 = 16.1\, t^2$$

$$\frac{70}{16.1} = t^2$$

$$4.347 = t^2$$

$$\sqrt{4.347} = t$$

$$t = 2.085 \text{ sec}$$

Date 3/31/2026 M T W T F S S

Problem of the Day 72:

A object is moving in the X
How fast will the Object be moving
in 15 sec if its speed is 10 ft/s
+ it has a constant acceleration
of 3 ft/s^2.

---

formula: $V_f = V_0 + at$

State your variables!

V_f = Final velocity = ?

V_0 = current velocity = 10 ft/sec

t = time = 15 sec

a = acceleration = 3 ft/sec^2

$$V_f = (10\ ft/sec) + (3\ ft/sec^2)(15\ sec)$$

$$V_f = 10\ ft/sec + 45\ ft/sec$$

$$\boxed{V_f = 55\ ft/sec}$$

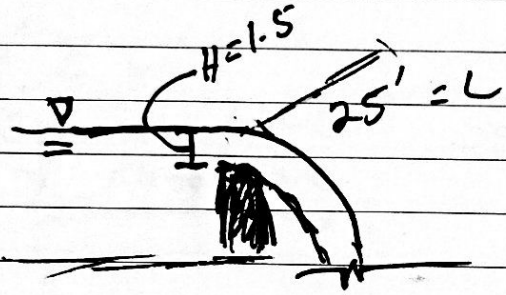
Date 4/1/2026 M T W T F S S

Problem of the Day 73:

A low weired Dam is 25 feet long without contraction & the water is 1.5 feet over the crest of the Dam. C = 3.33 for sharp crested low weired dam

$Q = CLH^{3/2}$

C = discharge coefficient
L = is the crest length
H = upstream Head over crest

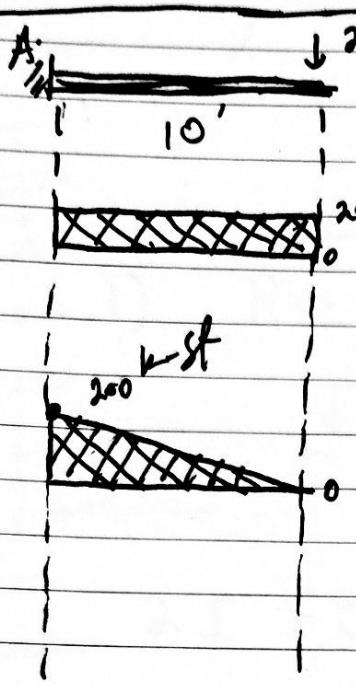


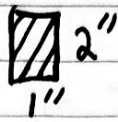
$Q = (3.33)(25)(1.5)^{3/2} = 3.33 \cdot 25 \cdot 1.837 =$

$Q = 153.0$ ft^3/sec $= 152.93$ ft^3/sec

Date 4 / 2 / 2026 M T W T F S S

Problem of the Day 74:
Find the max flexural stress in the Beam.





$+\circlearrowleft \Sigma m_A = 0 = -20(10) + M_A$

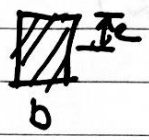
$M_A = 200^{k\text{-}ft}$

$\Sigma F_y = 0 = A_y - 20$

$+\uparrow A_y = 20^{k}$

M_A = Max moment

$\sigma_{flexure} = \frac{Mc}{I}$



~~X~~ Not realistic from a design standpoint since steel yeilds @ ≈ 45 ksi so you would need a bigger member

$I = \frac{1}{12} bh^3 = \frac{1}{12}(1)(2)^3 = 0.667 in^4$

$b = 1''$

$h = 2''$

$M = 200^{k\text{-}ft} \rightarrow \frac{200^{k\text{-}ft}}{1} \left| \frac{1000^{lb}}{1k} \right| \frac{12^{in}}{1ft}$

$M = 2{,}400{,}000^{in\text{-}lbs}$

$c = 1''$

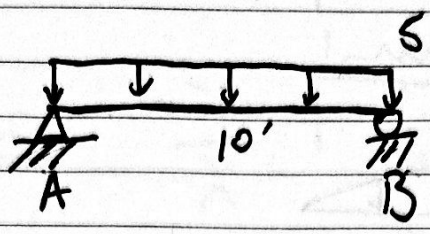
$\sigma = \frac{2{,}400{,}000^{lb\text{-}in} \cdot 1 in}{0.667 in^4} = 3{,}598{,}200 psi$

$= 3{,}598 ksi$

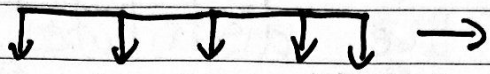
Date 4/3/2026 M T W T F S S

Problem of the Day 75:

Solve for the reaction forces in the Beam!

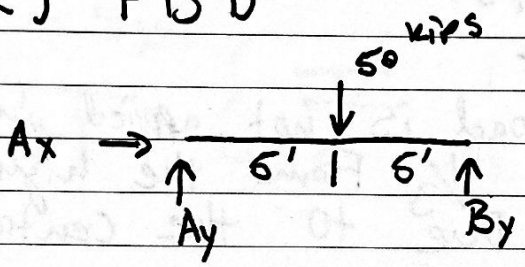


1) Resolve the distributed load



$(10')(5\ ^{kip}/_{ft}) = 50\ kips$

2) FBD



3) Σmoments @ A, Then ΣFy

$+\circlearrowleft \Sigma M_A = 0 = (-50^{k})(5') + B_y\,10'$

$250^{k\text{-}ft} = B_y(10')$

$\boxed{B_y = 25\ kips \uparrow +}$

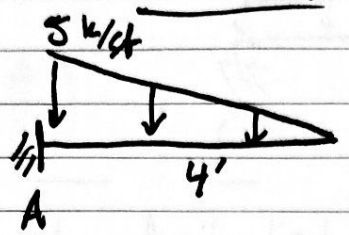
$+\uparrow \Sigma F_y = 0 = A_y - 50^{k} + 25^{k}$

$\boxed{A_y = 25\ kips \uparrow +}$

Date 4/4/2026 M T W T F S S

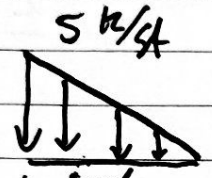
Problem of the Day 76

Solve for the reaction forces in the Beam!



---

1) Resolve the distributed load

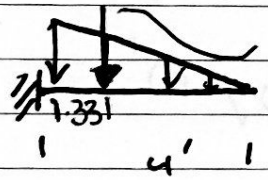


→ Find the area → $\frac{1}{2}(5)(4)$

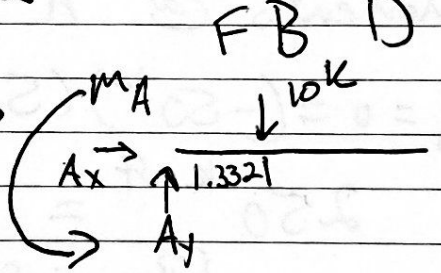
← 10 kips

★ Now the load is not applied in the middle it is 1/3 From the high side of the tricngle Due to the centroid

$4 \cdot \frac{1}{3} = 1.332'$



→



2) $+\circlearrowleft \sum M_A = 0 = M_A - 10 \cdot 1.332$

$$\boxed{M_A = 13.32 \text{ k-ft}}$$

3) $+\uparrow \sum F_y = 0 = -10^k + A_y$

$$\boxed{A_y = 10^k}$$

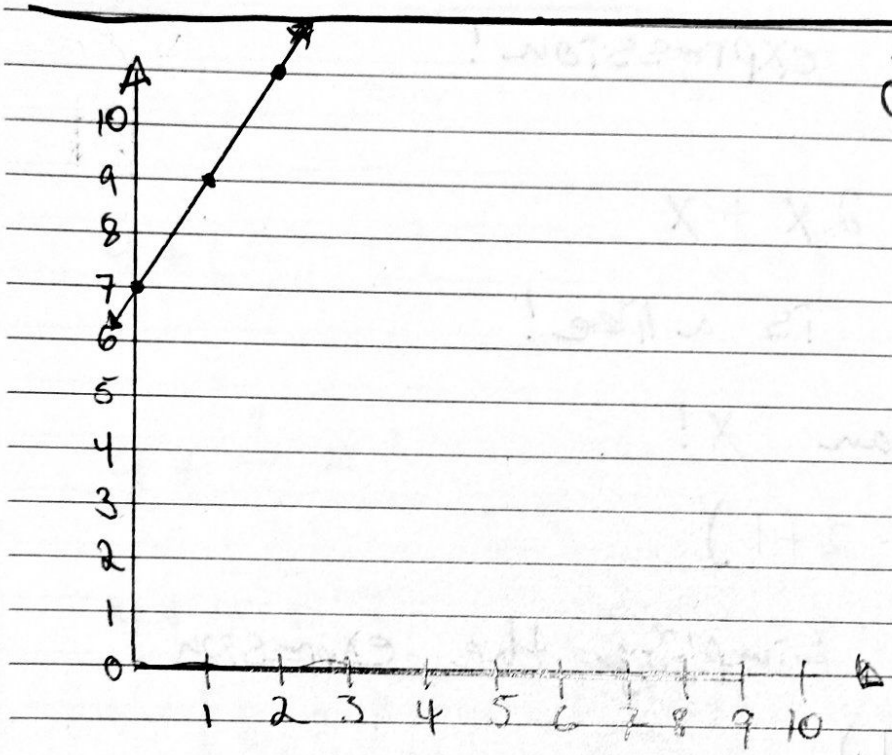
4) $\sum F_x = 0$

Date 4/5/2026 M T W T F S S

Problem Of the Day 77:

Solve for the y-intercept!

$$y = 2x + 7$$



$y = mx + b$

$m = 2$

$b = 7$

~~*~~ plug in + plot

y-intercept → (x, y) → (0, ?)

↑ What we are trying to solve.

$y = 2(0) + 7 \rightarrow \boxed{y = 7}$ *

Other equations to make the line!

$y = 2(1) + 7 \rightarrow y = 2 + 7 \rightarrow y = 9$ ($x = 1$)

$y = 2(2) + 7 \rightarrow y = 4 + 7 \rightarrow y = 11$ ($x = 2$)

Answer → $y = 7$ → $\boxed{(0, 7)}$

Date 4/6/2026 M T W T F S S

Problem of the Day 78:

Factor the given problem

$x^4 + x^2 - 2x + x$

Factor the expression!

$x^4 + x^2 - 2x + x$

ask what is a like!

* pull out an x!

$x(x^3 + x - 2 + 1)$

↓ Simplify the expression

$x(x^3 + x - 1)$

Date 4/7/2026 M T W T F S S

Problem of the Day 79:

Evaluate the two variable expressions!

$4 + \left(\frac{x}{y}\right) = ?$

where $x = 8$ + $y = 2$

Simply plug in $x + y$ + then solve!

$4 + \left(\frac{x}{y}\right) = ?$ $\quad x = 8$, $y = 2$

$4 + \frac{8}{2} = ?$

$4 + 4 = ?$

$8 = ?$

Date 4/8/2026 M T W T F S S

Problem of the Day 80:

Evaluate the two variable expression!

$4x^2 + 2y =$ where $x = 3$ + $y = 5$

$4(x)^2 + 2(y) =$

Plug in the variables

$x = 3$ $y = 5$

$4(3)^2 + 2(5) =$

$4(9) + 10 =$

$36 + 10 =$ $\boxed{46}$ *

Date 4/9/2026 M T W T F S S

Problem of the Day 81:

Manipulating like terms!

$5x + 4y \longrightarrow$ $\boxed{5x + 4y}$

$5x \cdot 4y \longrightarrow$ $\boxed{20xy}$

$\frac{5x}{4y} \longrightarrow$ $\boxed{\frac{5x}{4y}}$

Date 4/10/2026 M T W T F S S

Problem of the Day 82:

Distribute the expression! & Simplify

$(4x^3+x+1)(8x-3)$

$(4x^3+x+1)(8x-3)$

$32x^4-12x^3$

↓

$(4x^3+x+1)(8x-3)$

$32x^4-12x^3+8x^2-3x$

↓

$(4x^3+x+1)(8x-3)$

$32x^4-12x^3+8x^2-3x+8x-3$

↓

$\boxed{32x^4-12x^3+8x^2+5x-3}$

Date 4/11/2026 M T W T F S S

Problem Of the Day 83:

Distribute the expression!

$8(2-x)$

$8(2-x)$

$16 - 8x$

↓

$-8x + 16$

Date 4/12/2026 M T W T F S S

Problem of the Day 84:

$y = 7(x) + 9$ where $x = -2$

Solve for y!

$y = 7(x) + 9$ where, $x = -2$

plug in x

$y = 7(-2) + 9$

↓

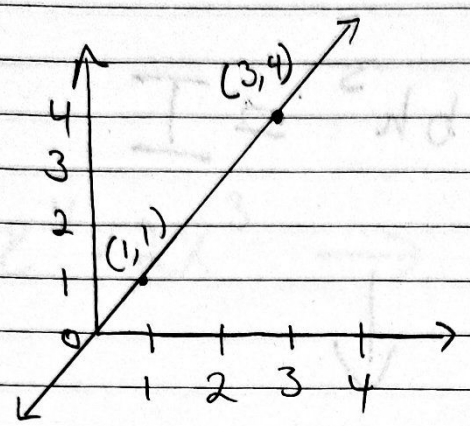
$y = -14 + 9$

$\boxed{y = -5}$

Date 4/13/2026 M T W T F S S

Problem of the Day 85:

Solve for m with the graph using the point slope formula!



$x = 1$

$y = 1$

$x_1 = 3$

$y_1 = 4$

point slope formula:

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

$$\downarrow$$

$$\frac{(y - y_1)}{(x - x_1)} = m$$

$$\downarrow$$

$$\frac{1 - 4}{1 - 3} = m$$

$$\downarrow$$

$$\frac{-3}{-2} = m$$

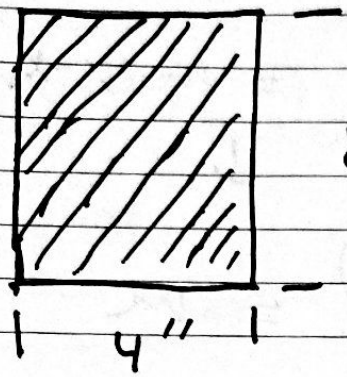
$$\downarrow$$

$$\boxed{1.5 = m}$$

Date 4/14/2026 M T W T F S S

Problem of the Day 86:

Find the moment of inertia of the square!



$$\frac{1}{12}bh^3 = I$$

$$\frac{1}{12}(4)(8)^3 = I$$

$$\frac{1}{12}(4)(512) = I$$

$$\boxed{170.67 \text{ in}^4} = I$$

Date 4 / 15 / 2026 M T W T F S S

Problem of the Day 87:

Find the common Denominator:

$$\frac{x}{2} + \frac{3x}{5}$$

$$\frac{x}{2} \cdot \left(\frac{5}{5}\right) + \frac{3x}{5} \cdot \left(\frac{2}{2}\right)$$

$$\frac{5x}{10} + \frac{6x}{10} \rightarrow \boxed{\frac{11x}{10}}$$

Date 4/16/2026 M T W T F S S

Problem of the Day 88:

Add the Fractions:

$\frac{1}{3} + \frac{1}{2} = ?$

$\frac{1}{3} \cdot \frac{2}{2} + \frac{1}{2} \cdot \frac{3}{3} =$

↓ ↓

$\frac{2}{6} + \frac{3}{6} = \boxed{\frac{5}{6}}$

Date 4/17/2026 M T W T F S S

Problem of the Day 89

Divide fractions!

$\frac{5}{8} \div \frac{2}{3} = ?$

$\frac{\frac{5}{8}}{\frac{2}{3}} \rightarrow \frac{5}{8} \cdot \frac{3}{2} = \boxed{\frac{15}{16}}$

Visit: Universityshortcuts.com

Date 4/18/2026 M T W T F S S

Problem of the Day 90!

Divide Fractions!

$\frac{3}{2} \div \frac{4}{9} = ?$

$\frac{3/2}{4/9} \rightarrow \frac{3}{2} \cdot \frac{9}{4} = \frac{27}{8}$

$3\frac{3}{8}$

Visit: UniversityShortcuts.com

Date 4 / 19 / 2026 M T W T F S S

Problem of the Day 91:

Simplify!

1) $\frac{\sin(x)\cos(x)}{\sec(x)}$ → 3) $\sin(x)\cos(x)\cos(x)$

2) $\frac{\sin(x)\cos(x)}{\frac{1}{\cos(x)}}$

4) $\sin(x)\cos^2(x)$

Date 4/20/2026 M T W T F S S

Problem of the Day 92: simplify

$$\frac{\sin(x)\tan(x)}{\cos^2(x)}$$

$$\frac{\sin(x)\cdot\frac{\sin(x)}{\cos(x)}}{\cos^2(x)} \rightarrow \frac{\sin^2(x)\cdot\frac{1}{\cos(x)}}{\cos^2(x)}$$

$$\rightarrow \frac{\frac{\sin^2(x)}{\cos(x)}}{\frac{\cos^2(x)}{1}} \rightarrow \boxed{\frac{\sin^2(x)}{\cos^3(x)}}$$

Date 4/21/2026 M T W T F S S

Problem of the Day 93: Simplify

$$\frac{\sin(x) + \tan(x)}{\csc(x) + \sec(x)}$$

$$\frac{\sin(x) + \frac{\sin(x)}{\cos(x)}}{\frac{1}{\sin(x)} + \frac{1}{\cos(x)}}$$

Find CD (top) →

$$\frac{\frac{\cos(x)\sin(x) + \sin(x)}{\cos(x)}}{\frac{1}{\sin(x)} + \frac{1}{\cos(x)}}$$

Find CD Bottom →

$$\frac{\frac{\cos(x)\sin(x) + \sin(x)}{\cos(x)}}{\frac{1}{\sin(x)} \cdot \frac{\cos(x)}{\cos(x)} + \frac{1}{\cos(x)} \cdot \frac{\sin(x)}{\sin(x)}} \Rightarrow \frac{\frac{\cos(x)\sin(x) + \sin(x)}{\cos(x)}}{\frac{\cos(x) + \sin(x)}{\sin(x)\cos(x)}}$$

$$\frac{\cos(x)\sin(x) + \sin(x)}{\cos(x)} \cdot \frac{\sin(x)\cos(x)}{\cos(x) + \sin(x)}$$

Factor a $\cos(x)$ →

$$\frac{\cos^2(x)\sin^2(x) + \sin^2(x)\cos(x)}{\cos^2(x) + \cos(x)\sin(x)}$$

$$\frac{\cos(x)(\cos(x)\sin^2(x) + \sin^2(x))}{\cos(x)(\cos(x) + \sin(x))}$$

$$\boxed{\frac{\cos(x)\sin^2(x) + \sin^2(x)}{\cos(x) + \sin(x)}}$$

page.

Date 4/22/2026 M T W T F S S

Problem of the Day 94: Simplify!

$$\tan^2(x) + \tan^2(x)$$

$$\tan^2(x) + \tan^2(x) = 2\tan^2(x)$$

Like terms

Date 4/23/2026 M T W T F S S

Problem of the Day 95:

Solve the problem by simplifying

$$\frac{x+4}{2x} + \frac{x^2+3}{x}$$

$$\frac{x+4}{2x}\cdot\frac{(x)}{(x)} + \frac{x^2+3}{x}\cdot\frac{2x}{2x}$$

term 1 $\dfrac{x^2+4x}{2x^2}$ term 2 $\dfrac{2x^3+6x}{2x^2}$

$$\frac{x^2+4x}{2x^2} + \frac{2x^3+6x}{2x^2} = \frac{2x^3+x^2+10x}{2x^2}$$

Factor out an x!

$$\frac{x(2x^2+x+10)}{x(2x)} \rightarrow \frac{2x^2+x+10}{2x}$$

Date 4/24/2026 M T W T F S S

Problem of the Day 96: Simplify!

$$\frac{\cos^2 x + \sin^2 x}{\sec^2 x}$$

$\cos^2 x + \sin^2 x = 1$

$\downarrow$

$\frac{1}{\sec^2 x} \rightarrow \boxed{\frac{1}{\sec^2 x}}$

Date 4/25/2026 M T W T F S S

Problem of the Day 97: Simplify!

$$\frac{x^2+3}{2x+5} - \frac{8x+4}{2x}$$

$$\frac{x^2+3}{2x+5} \cdot \frac{2x}{2x} - \frac{8x+4}{2x} \cdot \frac{2x+5}{2x+5}$$

$$\downarrow \qquad \downarrow$$

$$\frac{2x^3+6x}{4x^2+10x} - \frac{16x^2+8x+40x+20}{4x^2+10x}$$

$$\frac{2x^3+6x - 16x^2-8x-40x-20}{4x^2+10x}$$

$$\downarrow$$

$$\frac{2x^3-16x^2-40x-8x+6x-20}{4x^2+10x}$$

$$\downarrow$$

$$\frac{2x^3-16x^2-42x-20}{4x^2+10x}$$

Factor out a 2

$$\rightarrow \frac{x^3-8x^2-21x-10}{x^2+5x}$$

Date 4/26/2025 M T W T F S S

Problem of the Day 98:

A object has a mass of 10 kg what is the force?

$F = ma$

$a = 9.81\ m/s^2$

$M = 10\ kg$

$F = (10)(9.81) = 98.1\ \frac{kg \cdot m}{s^2}$

$= 98.1\ N$

Date 4/27/2026 M T W T F S S

Problem of the Day 99:

What is the weight of the water in a $10' \times 6' \times 8'$ tank?

Volume $= 10 \cdot 6 \cdot 8 = 480\ ft^3$

$\gamma_{water} = 62.4\ lb/ft^3$

Weight $= \gamma \cdot V = 62.4 \cdot 480 = \boxed{29,952\ lbs}$

Date 4/28/2026 M T W T F S S

Problem of the Day 100!

$2x^2+4x-2$

Solve for x!

$$2x^2+4x-2=0$$

↓ Factor out 2

$$2(x^2+2x-1)=0$$

↓

$$x^2+2x-1=0$$

$$x^2+2x=1$$ ← signal you need the quadratic formula.

$$\underset{a}{x^2}+\underset{b}{2}x\underset{c}{-1}$$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

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

↓

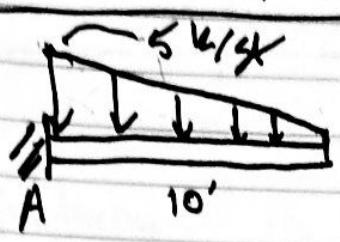
$$x=\frac{-2\pm\sqrt{4+4}}{2}$$

$$\left\{\begin{array}{l}-1+\sqrt{2}\\ -1-\sqrt{2}\end{array}\right\}=X$$

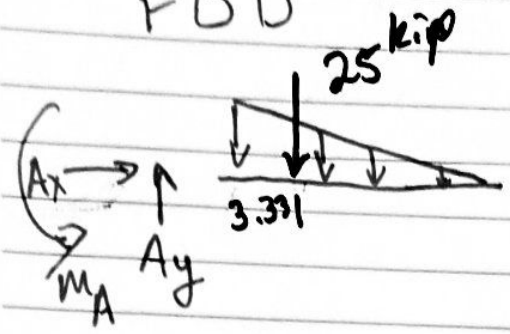
Date 4/29/2026 M T W T F S S

Problem of the Day 101!

Solve the forces in the Beam!



FBD



$5 \cdot 10 \cdot \frac{1}{2} = 25$ kips

$L = 10 \cdot \frac{1}{3} = 3.\overline{33}$

$\left(\pm\sum m_A = 0 = m_A - 25^{k}(3.33\,ft)\right.$

$m_A = 25^{k}(3.33\,ft)$

$\boxed{m_A = 83.3\ k\text{-}ft}$

$+\uparrow \sum f_y = 0 = -25 + A_y$

$\boxed{A_y = 25\ \text{kips}}$

$\boxed{A_x = 0^{k}}$

Date 4/30/2026 M T W T F S S

Problem of the Day 102!

Combining like terms!

$5x + x^2 - 3x^2 + x$

$5x + x + x^2 - 3x^2$

$6x + (-2x^2)$

$\boxed{6x - 2x^2}$

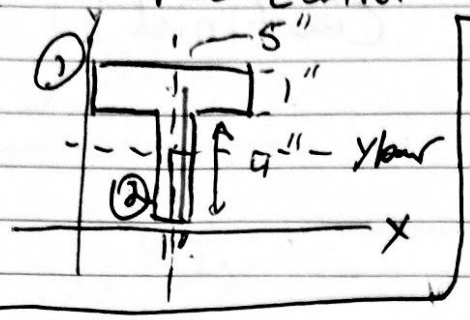
you can Factor!! pull out an X!

$\boxed{x(6 - 2x)}$

Date 5/01/2026 M T W T F S S

Problem of the Day 103!

Find the centroid of the shape!



① $\bar{x} = \frac{\Sigma A_i x_i}{\Sigma A_i} = \underline{2.5"}$

$\bar{y} = \frac{\Sigma A_i y_i}{\Sigma A_i} = \underline{?}$

④

	A_i	y_i	$A_i y_i$
1	5	4.5	22.5 in^3
2	4	2	8 in^3

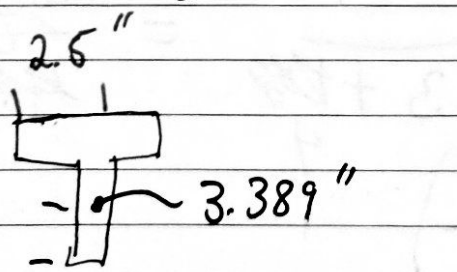
② $A_1 = (1)(5) = 5\ in^2$

$A_2 = (1)(4) = 4\ in^2$

③ y_2 (From x-axis) $= 4/2 = 2"$

y_1 (From x-axis) $= 4 + 1/2 = 4.5"$

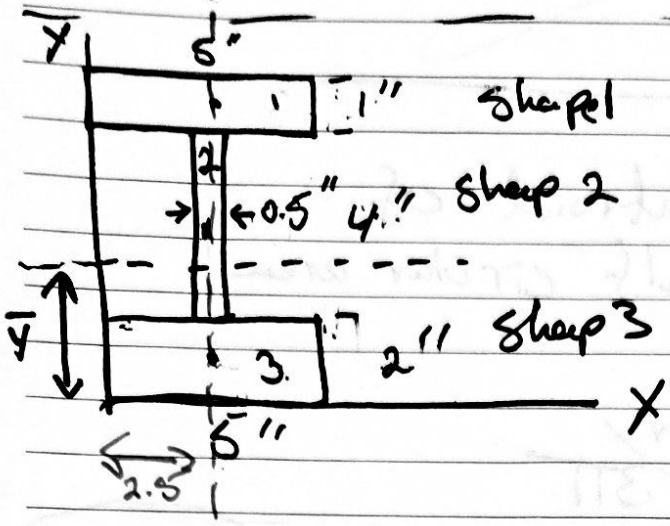
$\bar{y} = \frac{\Sigma A_i y_i}{\Sigma A_i} = \frac{22.5+8}{5+4} = \frac{30.5}{9} = \boxed{3.389"}$



Date 5/02/2026 M T W T F S S

Problem of the Day 104!

Find the centroid of the shape!



$\bar{X} = 2.5$

$\bar{y} = \frac{\Sigma A_i Y_i}{\Sigma A_i}$

$\bar{x} = \frac{\Sigma A_i X_i}{\Sigma A_i}$

$\bar{x} = 5/2 = 2.5''$

Because of its symmetrical

$\bar{y} = \frac{\Sigma A_i \cdot Y_i}{\Sigma A_i}$

$y_3 = 2/2 = 2/2 = 1''$

$y_2 = 2 + 4/2 = 4''$

$y_1 = 6 + 1/2 = 6.5''$

	A_i	Y_i	$A_i y_i$
1	$(1)(5) = 5\,in^2$	$6.5''$	$32.5\,in^3$
2	$(0.5)(4) = 2\,in^2$	$4''$	$8\,in^3$
3	$(2)(5) = 10\,in^2$	$1''$	$10\,in^3$

$$\bar{y} = \frac{10 + 8 + 32.5}{5 + 2 + 10} = \frac{50.5\,in^3}{17\,in^2} = 2.97''$$

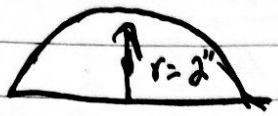
$\bar{x} = 2.5''$

$\bar{y} = 2.97''$

Date 5/03/2026 M T W T F S S

Problem of the Day 105!

Find the centroid of the shape!



Find centroid of the Half circular area!

$$C = \frac{4r}{3\pi}$$

$$C = \frac{4(2)}{3\pi} = \frac{8}{3\pi} = 0.85''$$