



Date 7/13/2026 M T W T F S S

Problem of the Day 176!

$$\frac{3x+1}{5x} - \frac{4x}{7x}$$

1)

$$\frac{3x+1}{5x} - \frac{4x}{7x}$$

$$\frac{3x+1}{5x} \cdot \frac{(7x)}{(7x)} - \frac{4x}{7x} \cdot \frac{(5x)}{(5x)}$$

$$(5x \cdot 7x) \rightarrow 35x^2$$

$$(3x+1) 7x \rightarrow 21x^2 + 7x$$

$$(4x) 5x \rightarrow 20x^2$$

$$\frac{21x^2 + 7x}{35x^2} - \frac{20x^2}{35x^2} \rightarrow \frac{21x^2 + 7x - 20x^2}{35x^2}$$

$$= \frac{x^2 + 7x}{35x^2} \rightarrow \boxed{\frac{x(x+7)}{35x^2}} \rightarrow \boxed{\frac{x+7}{35x}}$$



Date 7/14/2026 M T W T F S S

problem of the Day

177!

$$\frac{4x^2+2}{5x-1} + \frac{2x-1}{2x^2}$$

Solve!

$$1) \frac{4x^2+2}{5x-1} \cdot \frac{2x^2}{2x^2} + \frac{2x-1}{2x^2} \cdot \frac{5x-1}{5x-1}$$

$$2) (4x^2+2) 2x^2 \rightarrow 8x^4 + 4x^2$$

$$(2x-1)(5x-1) \rightarrow 10x^2 - 2x - 5x + 1 \rightarrow 10x^2 - 7x + 1$$

$$(5x-1)(2x^2) \rightarrow 10x^3 - 2x^2$$

$$3) \frac{8x^4+4x^2}{10x^3-2x^2} + \frac{10x^2-7x+1}{10x^3-2x^2} \rightarrow \frac{8x^4+4x^2+10x^2-7x+1}{10x^3-2x^2}$$

$$4) \frac{8x^4+14x^2-7x+1}{10x^3-2x^2} \rightarrow \boxed{\frac{8x^4+14x^2-7x+1}{x^2(10x-2)}}$$



Date 7/15/2026 M T W T F S S

problem of the Day 178!

$$y = 3x^2 + 7$$

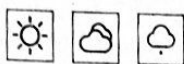
Find the y-Intercept

$$x=0 \rightarrow$$

$$y = 3(0)^2 + 7$$

$$\boxed{y=7}$$





Date 7/16/2026 M T W T F S S

Problem of the Day 179!

 $f(x) = e^{x^4}$ Take the Derivative!

$$1) f'(x) = e^{e^{x^4}} (e^{x^4}) (4x^3)$$

$$2) f'(x) = 4e^{e^{x^4}} \cdot e^{x^4} \cdot x^3$$

Exponent rule

$$3) f'(x) = 4e^{(e^{x^4} + x^4)} \cdot x^3$$



Date / /

M T W T F S S

Find the deflection of the wood Beam!

$$L = 34 \text{ inches}$$

$$\text{Force} = 1 \text{ lbs}$$

$$h = 0.247$$

$$b = 1.435$$

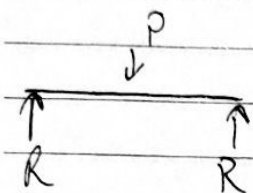
$$h = 0.247$$

$$b = 1.435$$

$$A = 0.354 \text{ in}^2$$

Wood $\rightarrow$ American pine

$$E = 580,000 \text{ psi weak} - 1,600,000 \text{ psi strong}$$



$$\frac{Pl^3}{48EI} = \Delta_{\text{max}}$$

$$I = \frac{1}{2}bh^3 = \frac{1}{2}(1.435)(0.247)^3 = 0.0018 \text{ in}^4$$

$$l = 34 \text{ inch}$$

$$P = 1 \text{ lb}$$

$$E = 1,600,000 \text{ psi}$$

$$= \frac{(1) \cdot (34)^3}{48(1,600,000)(0.0018)} = \frac{39,304}{138,240} = \boxed{0.28 \text{ in}}$$

Now check with the real world!



Date / /

M T W T F S S

How I Studied IN college!

1. went to class
2. Did the Homework
3. Look @ Syllabus
4. Redo Home work
5. Learn Items in syllabus THAT you don't know.
6. Do practices problems
7. Repeat 3, 5, + 6



Date / /

M T W T F S S

College Time Management!

- Have a dedicated Study Day/Time
- Do the easy items in your low strain classes
- Do your Homework Sooner rather than later
- Make a calendar for your classes + personal life
- Make a TO DOs list Every Day
- Try to be active everyday
- Leave your phone @ Home when you do Homework or Study or put it on Do not disturb.
- Try Studying + Do Homework in Different Quiet places!

Hope that
Helps!



Date / /

M T W T F S S

Why the first set of Exams so Important?

- If you do well it will make finals week easier
- They are sometimes harder because you don't know the professor's style.
- Allows you to connect what is important about the class in the lectures + the Exam!

www.UniversityShortcuts.com



Date / /

M T W T F S S

Day OS To Dos & classes Example!

To Dos

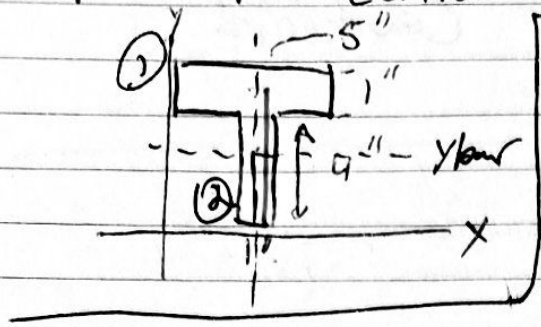
7:00 get up
Breakfast
8:00 Statics
↓
9:00 Calc III
↓
10:00 Physics
↓
11:00 Lunch
Study
12:00
↓
1:00 } Calc III Hw
↓
2:00 Physics Lab
↓
3:00
↓
4:00 Statics Hw
↓
5:00 } study physics
6:00
↓
7:00 List
↓
8:00 Dinner
↓
9:00 } write comp paper 1 Hour
get ready for bed
10:00

- Statics Hw 30min
- Calc III Hw 1.5 hours
comp 1 paper 3 hours
Study for physics exam
2 hours



Problem of the Day 103!

Find the centroid of the shape!



$$\textcircled{1} \quad \bar{x} = \frac{\sum A_i x_i}{\sum A_i} = 2.5''$$

$$\bar{y} = \frac{\sum A_i y_i}{\sum A_i} = ?$$

$\textcircled{1}$	A_i	y_i	$A_i y_i$
1	5	4.5	22.5 in ²
2	4	2	8 in ²

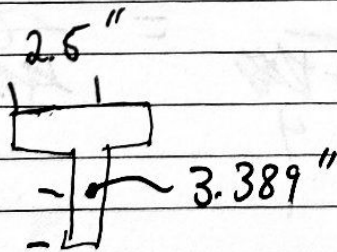
$$\textcircled{2} \quad A_1 = (1)(5) = 5 \text{ in}^2$$

$$A_2 = (1)(4) = 4 \text{ in}^2$$

$$\textcircled{3} \quad y_2 \text{ (From x-axis)} = \frac{4}{2} = 2''$$

$$y_1 \text{ (From x-axis)} = 4 + \frac{1}{2} = 4.5''$$

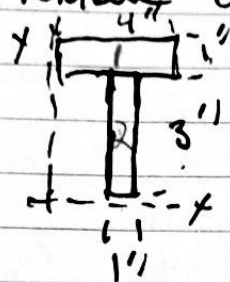
$$\bar{y} = \frac{\sum A_i y_i}{\sum A_i} = \frac{22.5 + 8}{5 + 4} = \frac{30.5}{9} = \boxed{3.389''}$$





Date 7/17/2026 M T W T F S S

Problem of the Day 180!



Find the Centroid!

$$\bar{y} = \frac{\sum A_i y_i}{\sum A_i}$$

1)	A_i	y_i	$A_i y_i$
	4	3.5	14
	3	1.5	4.5
	7	4.5	18.5

2)

$$A_1 = 1 \cdot 4 = 4 \text{ in}^2$$

$$A_2 = 1 \cdot 3 = 3 \text{ in}^2$$

$$y_1 = 3 + \frac{1}{2} = 3.5 \text{ in}$$

$$y_2 = \frac{3}{2} = 1.5 \text{ in}$$

$$3) \quad \bar{y} = \frac{\sum A_i y_i}{\sum A_i} = \frac{14 + 4.5}{3 + 4} = \frac{18.5}{7}$$

$$\bar{y} = \frac{18.5}{7} = \boxed{2.64 \text{ in}}$$



Date 7/18/2022 M T W T F S S

Problem of the Day 181!

$$\int x^4 dx$$

$$\int x^4 dx \rightarrow \boxed{\frac{x^5}{5} + C}$$



Date 7/19/2026

M T W T F S S

problem of the Day 182!

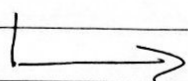
Solve,

$$\int 5x \cos(4x^2) dx$$

$$\int 5x \cos(4x^2) dx$$

1) Set $4x^2 = u$ + dx solve for it on the side!

$$\int 5x \cos(u) dx$$



$$2) u = 4x^2 \\ du = 8x dx$$

Solve for dx

$$3) \int 5x \cos(u) \frac{du}{8x} \quad \leftarrow \quad \frac{du}{8x} = dx$$

$$4) \frac{5}{8} \int \cos(u) du$$



$$5) \frac{5}{8} \sin(u) + C$$



$$\boxed{\frac{5}{8} \sin(4x^2) + C}$$



Date 7/20/2020 M T W T F S S

Problem of the Day 183!

Solve with Integration by Parts!

$$\int u dv = uv - \int v du \quad \int e^x \sin x dx$$

LIATE Choose your U

Logs, Inverse, Algebraic, Trig, Exponential

1) reorder

$$\int \sin(x) e^x dx$$

2) Plug into formula

$$u = \sin(x) \\ du = \cos(x)$$

$$\sin(x) e^x - \int e^x \cos(x) dx$$

$$v = e^x \\ dv = e^x$$

3) reorder

$$\sin(x) e^x - \int \cos(x) e^x dx$$

$$u = \cos(x)$$

$$du = -\sin(x) dx$$

$$\sin(x) e^x - (\cos(x) e^x - \int -\sin(x) e^x dx) \quad v = e^x \\ dv = e^x$$

$$\sin(x) e^x - (\cos(x) e^x + \int \sin(x) e^x dx)$$

We got the original Integral so rewrite!

$$\int \sin(x) e^x dx = \sin(x) e^x - (\cos(x) e^x + \int \sin(x) e^x dx)$$

$$\int \sin(x) e^x dx = \sin(x) e^x - \cos(x) e^x - \int \sin(x) e^x dx$$

$$\int \sin(x) e^x dx + \int \sin(x) e^x dx = \sin(x) e^x - \cos(x) e^x$$

$$\int \sin(x) e^x dx = \frac{\sin(x) e^x - \cos(x) e^x}{2}$$

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



Date 7/21/2026 M T W T F S S

Problem of the Day 184!

$$\int 4x^2 dx$$

$$\int 4x^2 dx \rightarrow \frac{4x^{2+1}}{2+1} + C = \boxed{\frac{4x^3}{3} + C}$$



Date 7/22/2026

M T W T F S S

Problem of the Day 185!

$$f(x) = 3x^2 + 4$$

$$f'(x) = 6x^1$$

$$= 3 \cdot 2x^{2-1}$$



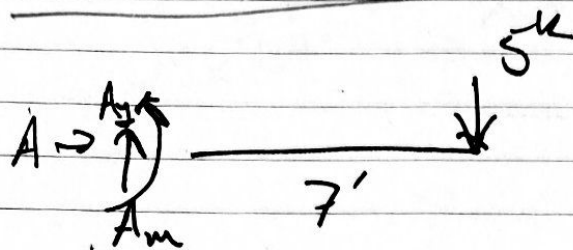
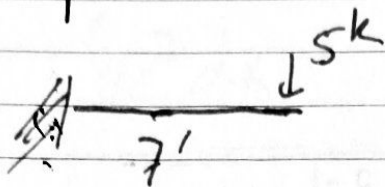
$$f'(x) = 6x$$



Date 7/23/2026

M T W T F S S

Problem of the Day 186!



$$\sum \tau_A = 0 = A_y - 5(7)$$

$$A_y = 35 \text{ k}$$

$$\sum F_y = 0 = -5 + A_y$$

$$A_y = 5 \text{ k}$$



Date 7/24/2026 M T W T F S S

Problem of the Day 187!

The Quadratic Formula!

What Does it Do?

* a Fundamental algebraic formula
the you can use to find (roots)
of a quadratic equation!

What is a quadratic equation?

* It is a type of polynomial equation
where the highest exponent is to
the power of 2! * second-degree polynomial
+ will generally create two-roots!

What is a polynomial root?

* This is the value for the variable usually
X where it will make the whole
equation = to zero!

$$ax^2 + bx + c = 0$$

The Quadratic Formula!

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



Date 7/24/2026

M T W T F S S

problem of the Day 188!

find the roots of the polynomial!

$$3x^2 + 4x + 2$$

$$\underline{3x^2} + \underline{4x} + \underline{2} = 0$$

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

$$1) \frac{-4 \pm \sqrt{4^2 - 4(3)(2)}}{2(3)}$$

2)

$$\frac{-4 + \sqrt{4^2 - 4(3)(2)}}{2(3)} \rightarrow \frac{-4 + \sqrt{16 - 24}}{6}$$

$$\rightarrow \frac{-4 + \sqrt{-8}}{6} \rightarrow \frac{-4 + \sqrt{8} \sqrt{-1}}{6}$$

$$\rightarrow \frac{-4 + 2\sqrt{2}i}{6} \rightarrow \boxed{\frac{-2}{3} + \frac{\sqrt{2}}{3}i}$$

3) the other root

$$\boxed{-\frac{2}{3} - \frac{\sqrt{2}}{3}i}$$



Date 7/25/2026 M T W T F S S

Problem of the Day 189!

Find the Derivative!

$$f(x) = \ln(7x)$$

$$f'(x) = \frac{1}{7x} \cdot 7 = \frac{7}{7x} = \boxed{\frac{1}{x}}$$



Date 7/26/2026

M T W T F S S

Problem of the Day MO!

$$3x^2 + 1$$

Solve for the roots!

$$-1 + 3x^2 + 1 = 0 - 1$$

$$3x^2 = -1$$

$$\frac{3x^2}{3} = \frac{-1}{3}$$

$$x^2 = -\frac{1}{3}$$

$$\sqrt{x^2} = \sqrt{-\frac{1}{3}}$$

$$x = \pm \sqrt{-\frac{1}{3}}$$

$$\downarrow$$

$$x = \pm \frac{\sqrt{3}}{3} i$$

$$x_1 = + \frac{\sqrt{3}}{3} i$$

$$x_2 = - \frac{\sqrt{3}}{3} i$$



Date 7, 27, 2026

M T W T F S S

Problem of the Day 191!

Find the Derivative of the function!

$$f(x) = \ln(\cos(4x^2))$$

$$f(x) = \ln(\cos(4x^2))$$

1)

$$f'(x) = \frac{1}{\cos(4x^2)}$$

2)

$$f'(x) = \frac{1}{\cos(4x^2)} \cdot -\sin(4x^2)$$

$$3) f'(x) = \frac{-\sin(4x^2)}{\cos(4x^2)} \cdot 8x$$

$$4) f'(x) = -\tan(4x^2) 8x$$

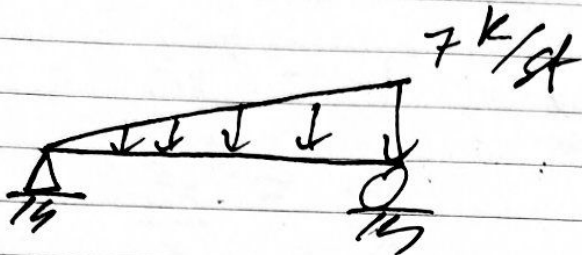
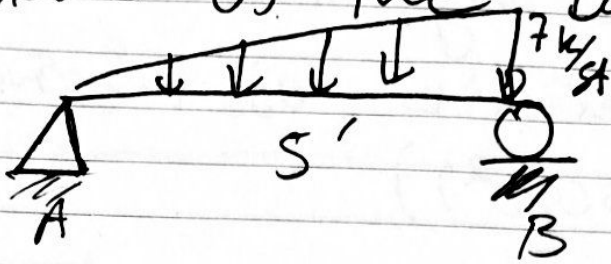
$$5) f'(x) = -8x \tan(4x^2)$$



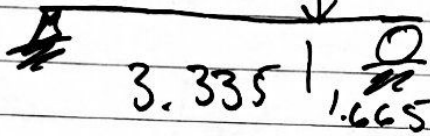
Date 7/28/2026

M T W T F S S

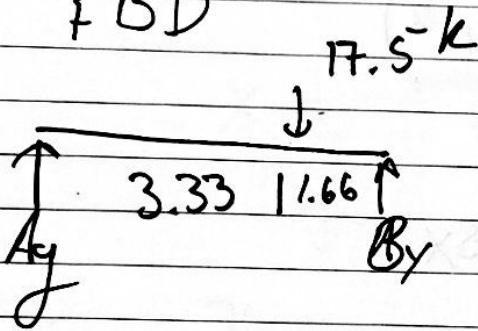
Problem of the Day 192!



$$35 \text{ k} / 2 = \underline{17.5 \text{ k}}$$



FBD



$$1) \sum F_x = 0$$

$$2) \sum M_A = 0 = -17.5(3.33) + B_y(5)$$

$$\boxed{B_y = 11.655 \text{ k}}$$

$$3) \sum F_y = 0 = -17.5 + 11.65 + A_y$$

$$\boxed{A_y = 5.85 \text{ k}}$$



Date 7/29/2026 M T W T F S S

Problem of the Day 193!

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

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

$$(x^2 \cdot 3x) + (x^2 \cdot 1) + (x \cdot 3x) + (x \cdot 1)$$

$$3x^3 + x^2 + 3x^2 + x$$

$$3x^3 + 4x^2 + x$$



Date 7/30/2026 M T W T F S S

problem of the Day 194!

$$f(x) = e^{(\cos(x) + 4x^2)}$$

Take the Derivative!

$$f(x) = e^{\cos(x) + 4x^2}$$

$$f'(x) = e^{\cos(x) + 4x^2} \cdot (-\sin(x) + 8x)$$

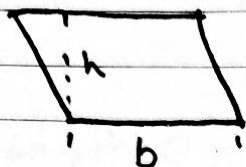
$$f'(x) = (-\sin(x) + 8x) (e^{\cos(x) + 4x^2})$$



Date 8/01/2026 M T W T F S S

Problem of the Day 195!

Find the area of the parallelogram.



$$b = 10$$

$$h = 3$$

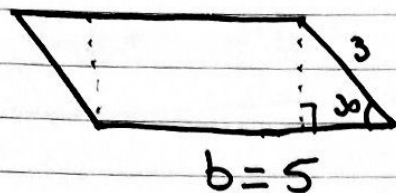
$$A = b \cdot h = 3 \cdot 10 = \underline{30 \text{ units}^2}$$



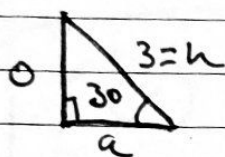
Date 8/02/2026 M T W T F S S

Problem of the Day 196!

find the Area of the parallelogram!



Soh cah toa

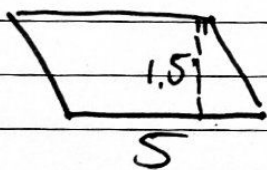


$$\sin(\theta) = \frac{O}{h}$$

$$\sin(30^\circ) = \frac{O}{3}$$

$$3(\sin(30^\circ)) = O$$

$$O = 1.5$$



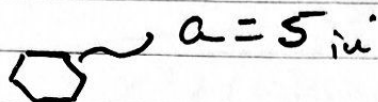
$$A = b \cdot h = 1.5 \cdot 5 = \boxed{7.5}$$



Date 8/03/2026 M T W T F S S

Problem of the Day 197!

Find the Area of a hexagon!



a = length of side

$$A = \frac{3\sqrt{3}}{2} a^2 = \frac{3\sqrt{3}}{2} (25) = \boxed{64.95 \text{ in}^2}$$



Date 8/04/2026

M T W T F S S

Problem of the Day 198!

Solve the problem!

$$\frac{4}{5} + 3 = ?$$

$$\frac{4}{5} + 3$$

↓

$$3 \cdot 5 \rightarrow \frac{15}{5} = 3$$

$$\frac{4}{5} + \frac{15}{5} = \boxed{\frac{19}{5}} = \underline{3\frac{4}{5}}$$



Date 8/05/2026 M T W T F S S

Problem of the Day 199!

$$x^2 + 1 = 2x$$

solve for x

then plug into $x^4 + 5$

$$x^2 + 1 = 2x$$

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

$$(x-1)(x-1)$$

$$x^2 - x - x + 1 \quad \checkmark$$

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

$$\underline{x=1}$$

$$x^4 + 5 =$$

$$(1)^4 + 5 = \boxed{6}$$



Date 8/06/2006

M T W T F S S

Problem of the Day 200!

Vectors!

$$\text{Magnitude 2D} = \sqrt{x^2 + y^2} = |V|$$

$$\text{Magnitude 3D} = \sqrt{x^2 + y^2 + z^2} = |V|$$

unit vector!

$$\hat{V} = \frac{\vec{V}}{|V|}$$

$$V = 2\hat{i} - 3\hat{j}$$

$$|V| = \sqrt{2^2 + (-3)^2} = \sqrt{4 + 9} = 3.6$$

$$\hat{V} = \frac{2\hat{i} - 3\hat{j}}{3.6} = \left[\frac{2\hat{i}}{3.6} - \frac{3\hat{j}}{3.6} \right] \leftarrow \text{Unit vector}$$

* A unit vector is a vector with a magnitude "length" of 1.

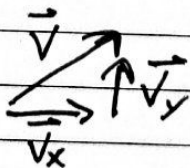
So, If you have a unit vector + a magnitude you can get a vector

$$\vec{V} = \hat{V} \cdot |V|$$

Components

$$(\vec{V}_x) = |\vec{V}| \cos \theta$$

$$(\vec{V}_y) = |\vec{V}| \sin \theta$$





Date 8/07/2026 M T W T F S S

Problem of the Day 201!

Find the Unit Vector of

$$\vec{a} \text{ where } \vec{a} = \{2i + 4j\}$$

Formula!

$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

$$|\vec{a}| = \sqrt{i^2 + j^2} = \sqrt{2^2 + 4^2} = \sqrt{4 + 16} = 4.47$$

$$\hat{a} = \frac{\{2i + 4j\}}{4.47} = \left\{ \frac{2i}{4.47} + \frac{4j}{4.47} \right\}$$

$$\hat{a} \approx 0.447i + 0.894j$$



Date 8/08/2026 M T W T F S S

Problem of the Day 202!

Take the Dot product
of the two vectors!

$$\vec{a} = i + 2j - 3k$$

$$\vec{b} = 2i - 2j - 4k$$

$$\vec{a} \cdot \vec{b} = 1 \cdot 2 - 2 \cdot 2 + (-3 \cdot -4)$$

~~$$\vec{a} \cdot \vec{b} = 2i - 4j + 12k$$~~

$$\vec{a} \cdot \vec{b} = 2 - 4 + 12 = \boxed{10}$$



Date 8/09/2026

M T W T F S S

Problem of the Day 203!

Find the Magnitude of vector $\vec{a}$

$$\vec{a} = 3\mathbf{i} + 2\mathbf{j} - 4\mathbf{k}$$

$$|\mathbf{a}| = \sqrt{i^2 + j^2 + k^2}$$

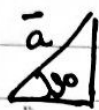
$$|\mathbf{a}| = \sqrt{3^2 + 2^2 + (-4)^2} = \sqrt{9 + 4 + 16} = \boxed{5.39}$$



Date 8/10/2026

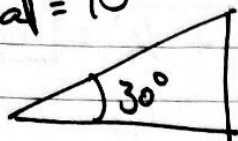
M T W T F S S

Problem of the Day 204!

Vector $\vec{a}$ has a magnitude of 10

Find the X + Y Components!

$$|\vec{a}| = 10$$



$$a_x = 10 \cos(30^\circ) = \boxed{8.66}$$

$$a_y = 10 \sin(30^\circ) = \boxed{5}$$



Date 8 / 11 / 2026 M T W T F S S

Problem of the Day 205!

Find the $\times$ product of $\vec{a} \times \vec{b}$

$$\vec{a} = \{ 2i + 5j + 3k \}$$

$$\vec{b} = \{ 8i + 3j + 2k \}$$

i	j	k		i	j
2	5	3		2	5
8	3	2		8	3

$$i(5 \cdot 2 - 3 \cdot 3) + j(3 \cdot 8 - 2 \cdot 2)$$

$$+ k(2 \cdot 3 - 5 \cdot 8)$$

$$\vec{A} \times \vec{B} = i(10 - 9) + j(24 - 4) + k(5 - 40)$$

$$\vec{A} \times \vec{B} = \{ i + 20j - 35k \}$$

$$\boxed{\{ i + 20j - 35k \}}$$



Date 8/12/2026 M T W T F S S

Problem of the Day 206!

$$f(x) = 3x^4 + 2x$$

Take the derivative!

$$f'(x) = 3 \cdot 4 x^{4-1} + 2 \cdot 1 x^{1-1}$$

$$f'(x) = (12x^3 + 2)$$

$$f'(x) = 12x^3 + 2$$



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problem of the Day 207!

$$f(x) = 3x \cdot 4x$$

Take the derivative!

$$f(x) = 12x^2$$

$$f'(x) = 12 \cdot 2x^{2-1}$$

$$f'(x) = 24x$$



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Problem of the Day 208!

$$(x+4)(7x+2)$$

Simplify!

$$(\underline{x} + \underline{4})(\underline{7x} + \underline{2})$$

$$(\underline{x} \cdot \underline{7x}) + (\underline{2} \cdot \underline{x}) + \underline{4} \cdot \underline{7x} + \underline{4} \cdot \underline{2}$$

$$7x^2 + 2x + 12x + 8$$

$$7x^2 + 14x + 8$$



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Problem of the Day 209!

Find the area of a octagon
with all sides = 5 = a

$$A = 2(1 + \sqrt{2})a^2$$

$$a = 5$$

$$A = 2(1 + \sqrt{2})(5^2) = 2(1 + \sqrt{2})(25)$$

$$A = 4.828(25) = \boxed{120.7 \text{ units}^2}$$



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problem of the Day 210!

$\frac{1}{4}$ of a unit circle!

