Date 2 / 23 / 2026 M T W T F S S

Problem of the Day 36

Find the Derivative $e^{x^6} = f(x)$

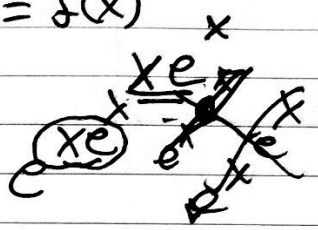
1) $f(x) = e^{x^6}$

$f'(x) = \underbrace{e^{x^6} \cdot 6x^5}_{\text{Chain rule}} = \boxed{6x^5 e^{x^6}}$

---

2) Find the Derivative $e^{xe^x} = f(x)$

apply the chain rule



$f'(x) = e^{xe^x} \frac{d}{dx} xe^x$ ← product rule nested in

↓

$f'(x) = e^{xe^x}((x)(e^x) + (1)(e^x))$

$\boxed{f'(x) = e^{xe^x}(xe^x + e^x)}$

$f(x) = x$

$g(x) = e^x$

$f'(x) = 1$

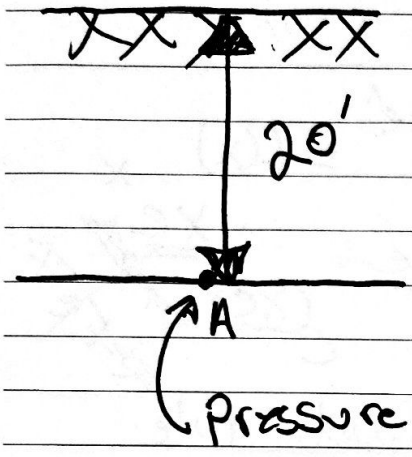
$g'(x) = e^x$

Date 2/24/2026 M T W T F S S

Problem of the Day 37

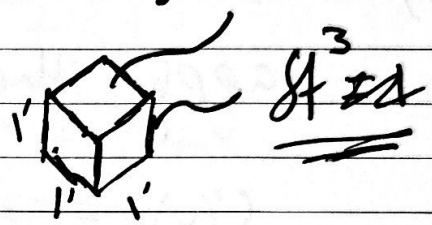
Soils weights 115 lb/ft^3
What is the pressure of the soil 20 ft down in psf?

$\sigma_{psf} = \gamma \cdot h$



Pressure @ point A

$\gamma = 115\ lb/ft^3$



ft^3

$\sigma_{psf} = \gamma \cdot h = 115\ lb/ft^3 \cdot 20\ ft$

$= 2{,}300$ psf

$= 2{,}300\ lbs/ft^2$

Download a PDF of the problem of the Day on my website:

www.Universityshortcuts.com

Date 2/25/2026 M T W T F S S

Problem of the Day 38

A Box has a volume of 3 cubic ft and a mass of 10 slugs. what is the unit weight & the density?

ρ = mass/volume = $10/3$ = **3.33 slugs/ft³**

ρ Density

mass = 10 slugs

volume = 3 ft³

γ = force/volume = $\rho \cdot g$

γ unit weight

Force = mass · accelration

g = gravity = 32.2 ft/sec²

$\gamma = 3.33 \frac{\text{slugs}}{\text{ft}^3} \cdot 32.2 \frac{\text{ft}}{\text{sec}^2}$ = **107.3 lb/ft³**

Date 2/26/2026 M T W T F S S

Problem of the Day 39
Properties of Natural Logs

1) $\ln(1) = 0$

2) $\ln(xy) = \ln(x) + \ln(y)$

3) $\ln(x/y) = \ln(x) - \ln(y)$

4) $\ln(x^r) = r\ln(x)$

These are needed in <u>calc</u>!

It is helpful when taking Derivatives! or Integrals!

Date 2/27/2024 M T W T F S S

Problem of the day 40:

Take the Derivative of the following:

1) $f(x) = \ln(x^4)$

$f'(x) = \frac{1}{x^4} \cdot \frac{d}{dx} x^4 = \frac{1}{x^4} \cdot 4x^3$

$\boxed{f'(x) = 4/x}$

or

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

$f(x) = 4\ln(x)$

$f'(x) = 4\left(\frac{1}{x}\right) = \boxed{4/x}$

2) $f(x) = \ln\left(\frac{\sqrt{x+1}}{2x}\right)$

use log properties of ln

$= \ln(\sqrt{x+1}) - \ln(2x)$

$f'(x) = \frac{1}{\sqrt{x+1}} \cdot \frac{d}{dx}(\sqrt{x+1}) - \frac{1}{2x} \cdot \frac{d}{dx}(2x)$

$f'(x) = \frac{1}{\sqrt{x+1}} \cdot \frac{1}{2} \cdot (x+1)^{-1/2} \cdot \frac{d}{dx}(x+1) - \frac{1}{2x} \cdot 2$

$f'(x) = \frac{1}{\sqrt{x+1}} \cdot \frac{1}{2\sqrt{x+1}} \cdot 1 - \frac{1}{x}$

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

add

$\boxed{f'(x) = \frac{1}{2(x+1)} - \frac{1}{x}}$ → or $f'(x) = \frac{1}{2x+2} - \frac{1}{x}$

Date 2/28/2026 M T W T F S S

Problem of the Day 41:

Find the Derivative of the following function.

$f(x) = x\cos(x)$

- you may think you can just Derive the function like a normal trig Derivative but this is not the case since the function is $x \cdot \cos(x)$ ← multiply

So, we will need to use The product rule

$f(x) = x$

$g(x) = \cos(x)$

$f'(x) = 1$

$g'(x) = -\sin(x)$

$f'(x) = f(x)g'(x) + f'(x)g(x)$

$= x(-\sin(x)) + (1)(\cos x)$

$= -x\sin(x) + \cos(x)$

$= \cos(x) - x\sin(x)$

Date 3/04/2026 M T W T F S S

Problem of the Day 42:

Implicit Differentiation!

→ Solve the fuction! with Implizit Differentiation

1) $2x^2 + 4y^4 = 3$

- Solve with respect to x

$$\frac{d}{dx}(2x^2) + \frac{d}{dx}(4y^4) = \frac{d}{dx}(3)$$

$$\rightarrow ((2\cdot 2)x^{2-1}) + ((4\cdot 4)y^{4-1})\frac{dy}{dx} = 0$$

$$\rightarrow 4x + 16y^3\frac{dy}{dx} = 0$$

→ Solve for dy/dx

$$-4x + 4x + 16y^3\frac{dy}{dx} = 0 - 4x$$

$$16y^3\frac{dy}{dx} = -4x$$

$$\frac{16y^3}{16y^3}\cdot\frac{dy}{dx} = \frac{-4x}{16y^3}$$

$$\frac{dy}{dx} = \frac{-4x}{16y^3} \rightarrow \boxed{\frac{dy}{dx} = -\frac{x}{4y^3}}$$

* If it's with respect to x the x is on bottom & y ontop

↳ $\frac{dy}{dx}$

This is from the chain rule

Date 3/2/2026 M T W T F S S

Problem of the Day 43:
Implicit Differentiation!

* With respect to X

Solve the fuction
With Implicit Differentiation!

---

1) $4x^3 + 2\ln y = 4$

* Solve with respect to X

Solve with respect to X

$$\frac{d}{dx}(4x^3) + \frac{d}{dx}(2\ln y) = \frac{d}{dx}(4)$$

$$(4\cdot 3)x^{3-1} + \left(\frac{2}{y}\right)\frac{dy}{dx} = 0$$

* If it's with respect to x x is on bottom & y is on top

dy/dx

$$12x^3 + (2/y)\frac{dy}{dx} = 0$$

$$-12x^3 + 12x^3 + \frac{2}{y}\frac{dy}{dx} = -12x^3$$

$$\left(\frac{2}{y}\right)\frac{dy}{dx} = -12x^3$$

$$y \cdot \frac{2}{y}\frac{dy}{dx} = -12x^3 \cdot y$$

$$2\frac{dy}{dx} = -12x^3 y$$

$$\frac{2}{2}\frac{dy}{dx} = \frac{-12x^3 y}{2} \rightarrow \boxed{\frac{dy}{dx} = -6x^3 y}$$

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

Problem of the Day 44: w/ respect to x

Implicit Differentiation!

Solve the fuction with Implicit Differentiation!

1) $\sin(x) - 3y^4 = x + 1$

$\frac{d}{dx}(\sin(x)) - \frac{d}{dx}(3y^4) = \frac{d}{dx}(x+1)$

$\cos(x) - (3 \cdot 4y^3)\frac{dy}{dx} = 1$

$\cos(x) - (12y^3)\frac{dy}{dx} = 1$

* Solve with respect to x

$-\cos(x) + \cos(x) - 12y^3\frac{dy}{dx} = 1 - \cos(x)$

$(-12y^3)\frac{dy}{dx} = 1 - \cos(x)$

these are multiplied

$\frac{-12y^3}{-12y^3}\frac{dy}{dx} = \frac{1-\cos(x)}{-12y^3}$

$\frac{dy}{dx} = \frac{1-\cos(x)}{-12y^3}$

Factor the negitive out

$$\frac{dy}{dx} = \frac{\cos(x)-1}{12y^3}$$

* If it's with respect to x, x is on Bottom y is on top

$\frac{dy}{dx}$

This is from change rule

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

Problem Of the Day 45:

Solve:

$$\int \frac{1}{x^4} + 2\,dx$$

$$= \int \frac{1}{x^4}\,dx + \int 2\,dx$$

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

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

$$= -\frac{x^{-3}}{3} + 2x + C$$

C = All Real #

Date 3/5/2026 M T W T F S S

Problem of the Day 46:

Solve the Derivative! $f(x) = \ln(e^x)$

$$f'(x) = \frac{d}{dx}\left(\ln(e^x)\right)$$

$$f'(x) = \frac{d}{dx}(x)$$

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

Date 3/6/2026 M T W T F S S

Problem of the Day 47:

Find the Derivative:

$f(x) = \tan(x)\sin(x)$

$f(x) = \tan(x)\sin(x)$

product rule

This is because they are multiplied

$= \tan(x)\sin(x)$

$f_1(x) = \tan(x)$

$g(x) = \sin(x)$

$f_1'(x) = \sec^2 x$

$g'(x) = \cos(x)$

product rule

$= f(x)g'(x) + f'(x)g(x)$

$= \tan(x)\cos(x) + \sec^2(x)\sin(x)$

Now Simplify the expression!

$= \frac{\sin(x)}{\cos(x)}\cos(x) + \left(\frac{1}{\cos(x)}\right)^2 \sin(x)$

$= \frac{\sin(x)}{\cos(x)}\cos(x) + \left(\frac{1}{\cos(x)}\right)^2 \sin(x)$

$= \sin(x) + \left(\frac{1}{\cos(x)}\right)^2 \sin(x)$

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

* Find a common Denominator

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

Proof: can factor/change to get $\rightarrow f'(x) = \sin x(1+\sec^2 x)$

Date 3/7/2026 M T W T F S S

Problem of the Day 48:

Find the Derivative:

$$f(x) = \frac{x^2}{\sin(x)}$$

---

* you could use the quotient or product rule
* going to use product rule.

$$f(x) = \frac{x^2}{\sin(x)} = x^2 \csc x$$

$f_1(x) = x^2$

$g(x) = \csc(x)$

$f_1'(x) = 2x$

$g'(x) = -\csc(x)\cot(x)$

product rule

$$= f_1(x)g'(x) + f_1'(x)g(x)$$

$$f'(x) = -x^2 \csc(x)\cot(x) + 2x\csc(x)$$

Factor out $-x\csc(x)$

$$f'(x) = -x\csc(x)(x\cot(x) - 2)$$

→ Reorder

$$\boxed{f'(x) = -x(x\cot(x) - 2)\csc(x)}$$

* product rule is simpler then the quotient rule for this problem

In the quotient rule simplifying will be harder & have more terms to mess with.

* Calculus is hard because of the algebra!

- If you see trig in the denominator try to rewrite the problem so its not a fraction.

Date 3/8/2026 M T W T F S S

Problem of the Day 49:

Find the Derivative:

$f(x) = \ln(x^4)\sin(4x)$

Use the product Rule.

- Also Chain Rule is needed

Inside product rule → Chain Rule

Set up product rule

~~$F'(x) = f'(g(x)) \cdot g'(x)$~~

$f(x) = \ln(x^4)\sin(4x)$

$f_1(x) = \ln(x^4)$

$g(x) = \sin(4x)$

$f_1'(x) = \frac{1}{x^4} \cdot 4x^3 = \frac{4}{x}$

$g'(x) = \cos(4x)4 = 4\cos(4x)$

Product Rule

$= f(x)g'(x) + f'(x)g(x)$

$= \ln(x^4) \cdot (4\cos(4x)) + \left(\frac{4}{x}\right)\sin(4x)$

$= \ln(x^4) \cdot (4\cos(4x)) + \frac{4\sin(4x)}{x}$

$= 4\ln(x^4)\cos(4x) + \frac{4\sin(4x)}{x}$

$= 4 \cdot 4\ln(x)\cos(4x) + \frac{4\sin(4x)}{x}$

$= 16\ln(x)\cos(4x) + \frac{4\sin(4x)}{x}$

$= \frac{x}{x}(16\ln(x)\cos(4x)) + \frac{4\sin(4x)}{x}$

$f'(x) = \frac{16x\ln(x)\cos(4x) + 4\sin(4x)}{x}$

Date 3/9/2026 M T W T F S S

Problem of the Day 50:

Solve the Problem:

$$\int_2^5 x^2\,dx$$

Definite Integral

$$\int_a^b f(x)\,dx = F(x)\Big|_a^b = F(b) - F(a)$$

$$= \int_2^5 x^2\,dx = \frac{x^3}{3}\Big|_2^5$$

$$= \frac{(5)^3}{3} - \frac{(2)^3}{3}$$

$$= \frac{125}{3} - \frac{8}{3} = \frac{117}{3} = \boxed{39}$$

Date 3/10/2026 M T W T F S S

Problem of the Day 51:

Solve the problem:

$$\int_1^3 x^3\sqrt{x}\,dx$$

Definite Integral

$$\int_a^b f(x)\,dx = F(x)\Big|_a^b = F(b) - F(a)$$

$$= \int_1^3 x^3\sqrt{x}\,dx = \int_1^3 x^3 \cdot x^{1/2}\,dx$$

Find common Denominator

$$= \int_1^3 x^{6/2} \cdot x^{1/2}\,dx = \int_1^3 x^{6/2+1/2}\,dx$$

$$= \int_1^3 x^{7/2}\,dx = \int_1^3 x^{7/2}\,dx \rightarrow \frac{x^{7/2+2/2}}{7/2+2/2}\Bigg|_1^3$$

$$= \frac{x^{9/2}}{9/2}\Bigg|_1^3 = \frac{2x^{9/2}}{9}\Bigg|_1^3 = \frac{2(3)^{9/2}}{9} - \frac{2(1)^{9/2}}{9}$$

$$\approx 31.177 - 0.222 = \boxed{30.955}$$

Date 3 / 11 / 2026 M T W T F S S

Problem of the Day 52:

Solve the problem!

Differentiation of Trig Functions

$f(x) = \sin x \rightarrow f'(x) = \cos x$

$f(x) = \cos x \rightarrow f'(x) = -\sin x$

$f(x) = \tan x \rightarrow f'(x) = \sec^2 x$

$f(x) = \cot x \rightarrow f'(x) = -\operatorname{cosec}^2 x$

$f(x) = \sec x \rightarrow f'(x) = \sec x \tan x$

$f(x) = \operatorname{cosec} x \rightarrow f'(x) = -\operatorname{cosec} x \cot x$

Date 3 / 12 / 2026 M T W T F S S

Problem of the day 53:

Inverse trig functions

$f(x) = \sin^{-1}(x) \Rightarrow f'(x) = \frac{1}{\sqrt{1-x^2}}$

$f(x) = \cos^{-1}(x) \Rightarrow f'(x) = -\frac{1}{\sqrt{1-x^2}}$

$f(x) = \tan^{-1}(x) \Rightarrow f'(x) = \frac{1}{1+x^2}$

$f(x) = \cot^{-1}(x) \Rightarrow f'(x) = -\frac{1}{1+x^2}$

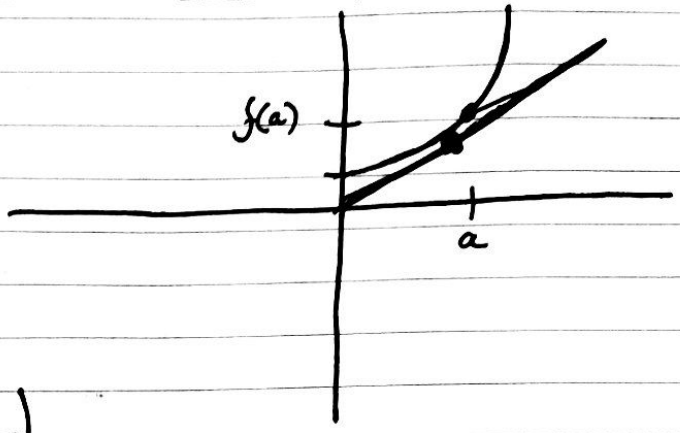
$f(x) = \sec^{-1}(x) \Rightarrow f'(x) = \frac{1}{|x|\sqrt{x^2-1}}$

$f(x) = (\operatorname{cosec}^{-1}(x)) \Rightarrow f'(x) = -\frac{1}{|x|\sqrt{x^2-1}}$

Date 3/13/2026 M T W T F S S

Problem of the Day 54:

Linear Approximation, (Linearization)



Formula:

$$L(x) = f(a) + f'(a)(x-a)$$

Example: Linear approximate the following fraction $F(x) = \sqrt{x}$ + where x is 26.

$F(x) = \sqrt{x} \rightarrow F'(x) = \frac{1}{2}x^{-1/2} = \frac{1}{2\sqrt{x}}$

$x = 26$

$a = 25$ → Plug into formula

$L(x) = f(a) + f'(a)(x-a)$

$f(a) = \sqrt{25} = 5$

$f'(a) = \frac{1}{2\sqrt{25}} = \frac{1}{2 \cdot 5} = \frac{1}{10}$

$L(x) = 5 + \frac{1}{10}(26-25) = 5 + \frac{1}{10} \cdot 1 = \boxed{5.1}$

Date 3/14/2026 M T W T F S S

Problem of the Day 55:

Take the Derivative:

$$f(x) = e^{x^2}$$

$$f'(x) = e^{x^2} \cdot 2x \quad \leftarrow \text{chain rule}$$

$$\boxed{f'(x) = 2xe^{x^2}}$$

$$\rightarrow \underline{\underline{e^{x^2} \cdot 2x^{2-1}}}$$

Date 3/15/2026 M T W T F S S

Problem of the Day 56:

Linear Approximation
(Linearization)

$f(x) = x^{1/3}$ where $x = 9$

---

formula:

$L(x) = f(a) + f'(a)(x-a)$

~~B~~ go pick the value of a

$x = 9$

$f(x) = x^{1/3}$ $\quad f'(x) = \frac{1}{3}x^{1/3-3/3} = \frac{1}{3}x^{-2/3}$

$f'(x) = \frac{1}{3}x^{-2/3}$

$f'(a) = \frac{1}{3}(8)^{-2/3} = 0.0833 = 0.083$

$a = 8$

$f(a) = (8)^{1/3} = 2$

$L(x) = 2 + 0.0833(9-8) = \boxed{2.0833}$

$= 2.08$ calc value

Date 3/16/2026 M T W T F S S

Problem of the Day 57:

A wheel has a radius of 2' & it accelerates @ 3 rad/s²

What is its linear acceleration?

$a = \alpha r$ formula

α = angler acceleration

r = radius

a = linear acceleration

plug & chugg!

$a = 3 \cdot 2 = \boxed{6 \text{ ft/s}^2}$

Date 3/17/2026 M T W T F S S

Problem of the Day 58:

Find the limit:

$$= \lim_{x \to 5} \frac{x^2 - 5}{x - 1}$$

$$= \lim_{x \to 5} \frac{(5)^2 - 5}{5 - 1} = \frac{25 - 5}{4} = \frac{20}{4}$$

$$= 5$$

Date 3/18/2026 M T W T F S S

Problem of the Day 59

Find the Derivative:

$$F(x) = \frac{x+3}{x-4}$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)\,f'(x) - f(x)\,g'(x)}{(g(x))^2}$$

$f(x) = x+3$

$g(x) = x-4$

$F(x) = \frac{x+3}{x-4}$

$F'(x) = ?$

$f'(x) = 1$

$g'(x) = 1$

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

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

$$= \frac{x-4-x-3}{(x-4)^2}$$

$$\boxed{F'(x) = -\frac{7}{(x-4)^2}}$$

Date 3/19/2026 M T W T F S S

Problem of the Day 60!

Find the Derivative.

$$F(x) = \frac{x+3}{x-4}$$

$$F(x) = (x+3)(x-4)^{-1}$$

use product & chain rule

Product rule → $f'(x) = f(x)g'(x) + f'(x)g(x)$

$f(x) = x+3$

$g(x) = (x-4)^{-1}$

$f'(x) = 1$

$g'(x) = -(x-4)^{-2} \cdot 1 = -(x-4)^{-2}$

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

$$= (x+3)\left(-\frac{1}{(x-4)^2}\right) + \frac{1}{(x-4)}$$

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

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

$$= \frac{-(x+3)+x-4}{(x-4)^2} = \frac{-x-3+x-4}{(x-4)^2} = \frac{-7}{(x-4)^2}$$

$$\boxed{F'(x) = -\frac{7}{(x-4)^2}}$$

Date 3/20/2026 M T W T F S S

Problem of the Day 61:

Integration by ~~parts~~ u-sub!

$$\int 4x^3(x^4+5)^4\,dx$$

rewrite

$$4\int x^3(x^4+5)^4\,dx$$

$u = x^4+5$

$du = 4x^3\,dx$

$\frac{du}{4x^3} = dx$

$$4\int x^3(u)^4\frac{du}{4x^3}$$

$$\cancel{4}\int \cancel{x^3}(u)^4\frac{du}{\cancel{4x^3}}$$

$$\int u^4\,du \rightarrow \frac{u^{4+1}}{4+1} = \frac{u^5}{5}+C$$

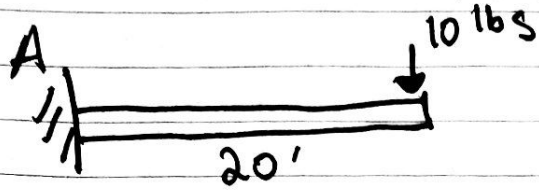
Plug u back into the fuction!

$$= \frac{(u)^5}{5}+C \rightarrow \boxed{\frac{(x^4+5)^5}{5}+C}$$

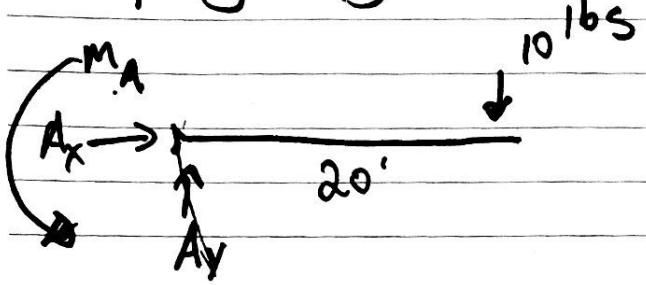
Date 3/21/2026 M T W T F S S

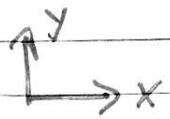
Problem of the Day 62:

Solve the reactions in the Beam @ A



FBD





SO, We are finding A_y, A_x + M_A

We have 3 unknowns + 3 equations.

(sum Forces in the X)

$\Sigma F_x = 0$ ✓ SO, $\boxed{A_x = 0}$ Since there is no force in the X.

(sum forces in the y)

$+\uparrow \Sigma F_y = 0 = -10^{lbs} + A_y$

↑ upward is +

SO, $\boxed{A_y = 10^{lbs} \uparrow}$

(Sum moments @ A)

$+\circlearrowleft \Sigma m_A = 0 = -(10^{lbs})(20') + M_A$

M_A is + because it is going CCW where the force of 10 is going clockwise + that direction is negitive

SO, $\boxed{M_A = 200^{lb\text{-}ft} \; +\circlearrowleft}$

Date 3/22/2026 M T W T F S S

Problem of the Day 63:

A stick of pipe is 36" in dia This is the OD. You need 300 ft of pipe how much soil does it displace after the pipe is backfilled / installed? Cubic yards are the units!

Outer Dia = 36"

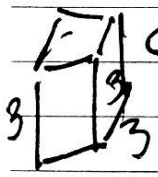
Area = πr^2 = $\pi (1.5')^2$ = 7.068 ft^2

r = (36/2)/12 → 1.5'

Length = 300 ft

Volume = Area · Length

= 7.068 ft^2 · 300 ft = 2,120 ft^3



ft^3 → yds^3 you divide by 27

= 2,120 / 27 = 78.539 cubic yards

★ note these are compacted cubic yards!

Date 3/23/2026 M T W T F S S

Problem of the Day 64:
Find the Derivative!

$$f(x) = \frac{4x^2 + 3x + 5}{x}$$

$$f(x) = \frac{4x^2}{x} + \frac{3x}{x} + \frac{5}{x}$$

$$f(x) = 4x + 3 + 5x^{-1}$$

$$f'(x) = 1 \cdot 4x^{1-1} + 0 + -5x^{-1-1}$$

$$f'(x) = 4 + 0 + -5x^{-2}$$

$$\boxed{f'(x) = 4 - \frac{5}{x^2}}$$

Date 3/24/2026 M T W T F S S

Problem of the 65:
Find the Derivative

$$f(x) = \frac{x^3}{x} + \frac{4x^5}{2} - 5x$$

Rewrite

$$f(x) = x^2 + 2x^5 - 5x$$

$$f'(x) = 2x + 10x^4 - 5$$

Date 3/25/2026 M T W T F S S

Problem of the Day 66:
Find the Derivative!

$$f(x) = \tan(x)\cos(x)$$

Re write!

$$f(x) = \frac{\sin(x)}{\cos(x)}\cos(x)$$

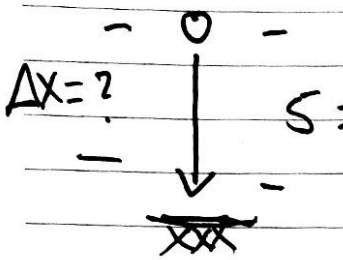
$$f(x) = \sin(x)$$

$$f'(x) = \cos(x)$$

Date 3/26/2026 M T W T F S S

Problem of the Day 67:

A ball is Dropped From a height + it takes 5 sec to Fall. How far did it fall?



We Know

$t = 5$ sec
$a = 32.2$ ft/sec^2
$v_0 = 0$
$x_0 = 0$
$x = ?$

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

plug in values

$x - 0 = (0 \cdot 5) + \frac{1}{2}(32.2)(5)^2$

$x = \frac{1}{2}(32.2)(5)^2$

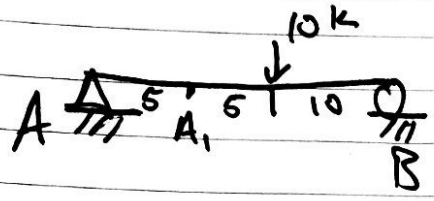
$= \frac{1}{2}(32.2)(25)$

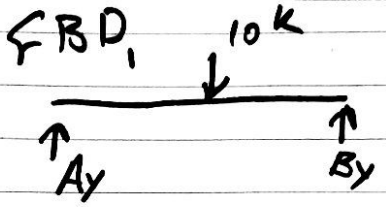
$\boxed{x = 402.5 \text{ ft}}$

Date 3/27/2026 M T W T F S S

Problem of the Day 68:

Solve the reaction forces + the internal forces @ A_1





$\Sigma F_x = 0$

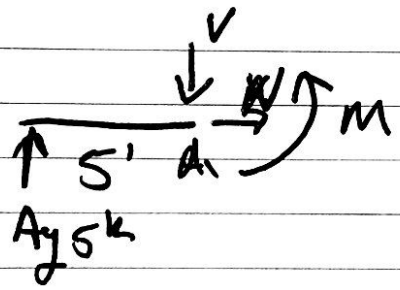
$+\circlearrowleft \Sigma M_A = 0 = -10(10) + 20B_y$

$B_y = 5^{kips} \uparrow$

$+\uparrow \Sigma F_y = 0 = -10 + 5 + A_y$

$A_y = 5^{kips} \uparrow$

FBD2



$\Sigma F_x = 0$

$\Sigma F_y = 0 = -V_{A_1} + 5$

$V_{A_1} = 5^{kips} \downarrow$

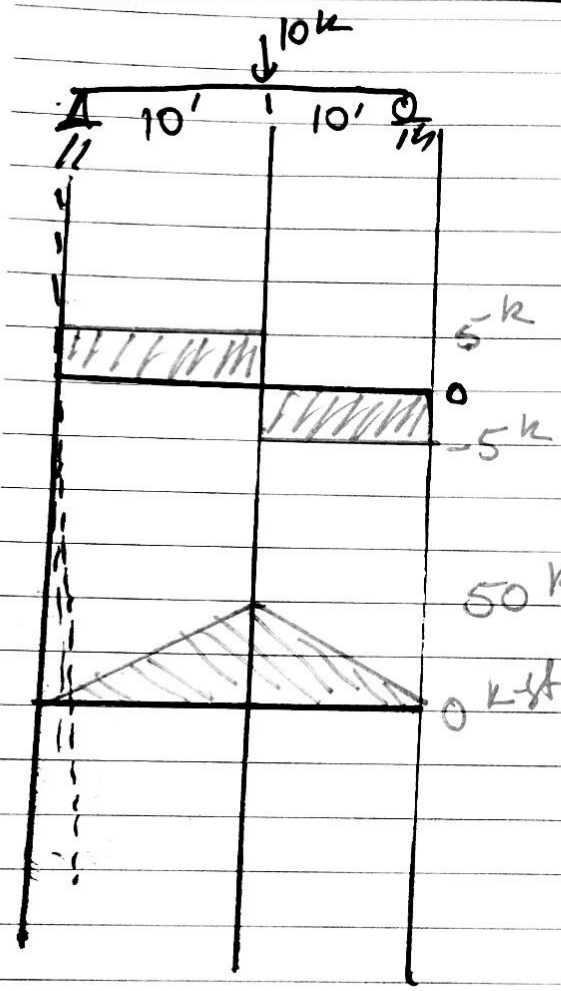
$+\circlearrowleft \Sigma M_{@A_1} = 0 = M_{A_1} - 5(5)$

$+\circlearrowleft M_{A_1} = 25^{k\text{-}ft}$

Date 3/28/2026 M T W T F S S

Problem of the Day 69:

Find Shear & Moment diagram of the Beam



Shear

$\Sigma F_x = 0$

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

$B_y = 5^k$

$\Sigma F_y = 0 = +5 - 10 + A_y$

$A_y = 5^k$

Right side of moment

$5^k \cdot 10^{ft} = 50^{k-ft}$

Left side of moment

$-5^k \cdot 10^{ft} = -50^{k-ft}$

Date 3/29/2026 M T W T F S S

Problem of the Day 70:

You have a water column that is 30 ft high how much pressure is the water putting at the bottom of the column in psi

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$\gamma = 62.4\ lb/ft^3$

$h = 30\ ft$

$psf = \gamma h = 30\ ft \cdot 62.4\ lb/ft^3 = 1{,}872\ lb/ft^2$

Convert units

$$\frac{1{,}872\ lb}{ft^2} \left| \frac{1\ ft^2}{12 \cdot 12\ in^2} \right. \rightarrow \boxed{13\ psi}$$

★ gauge pressure