NADIN ELSHIRBINI 72434.

28.01.2017

Q1. $-12(y+2)=(x-4)^2$

i) sketch

ii) vertex

iii) focus.

iv) directrix.

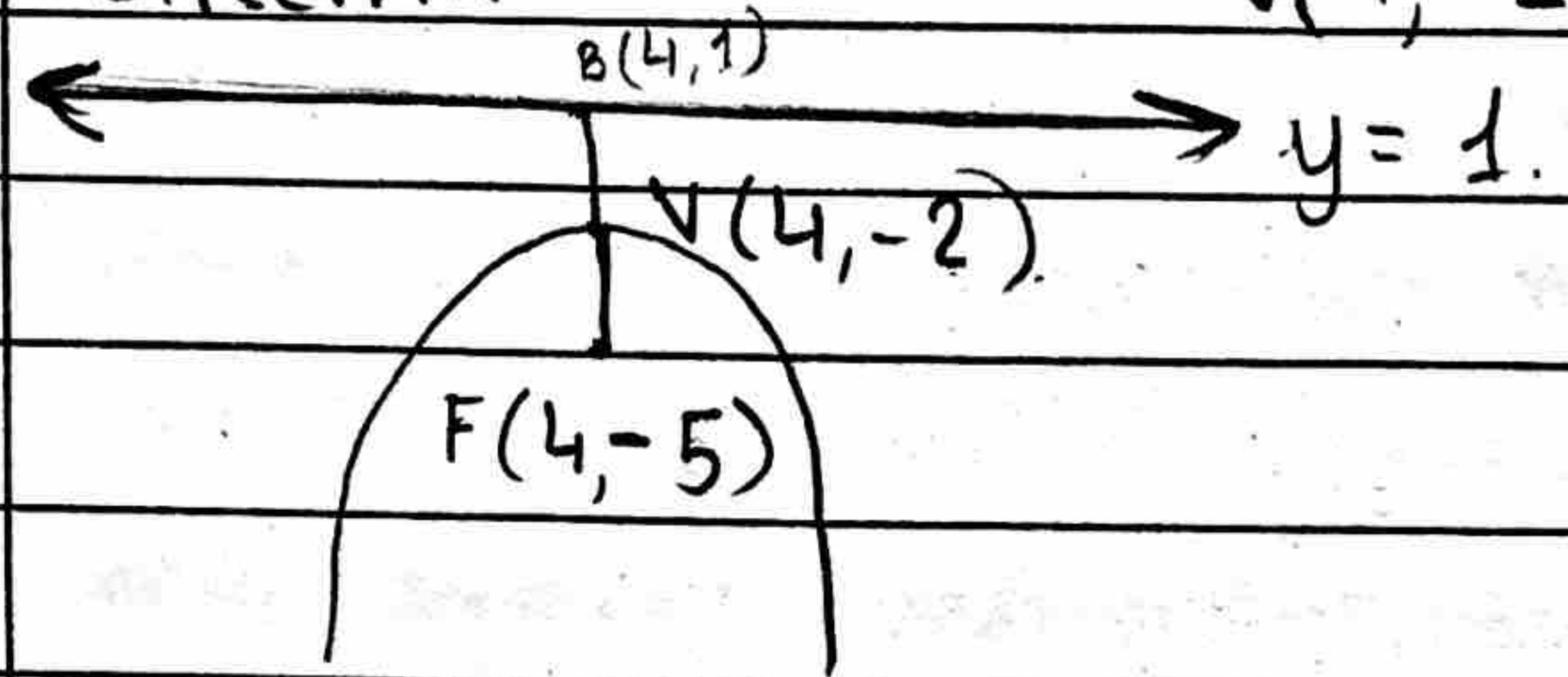
$*$ directrix is horizontal

$4d=-12$

$d=-3<0 \Rightarrow$ open down.

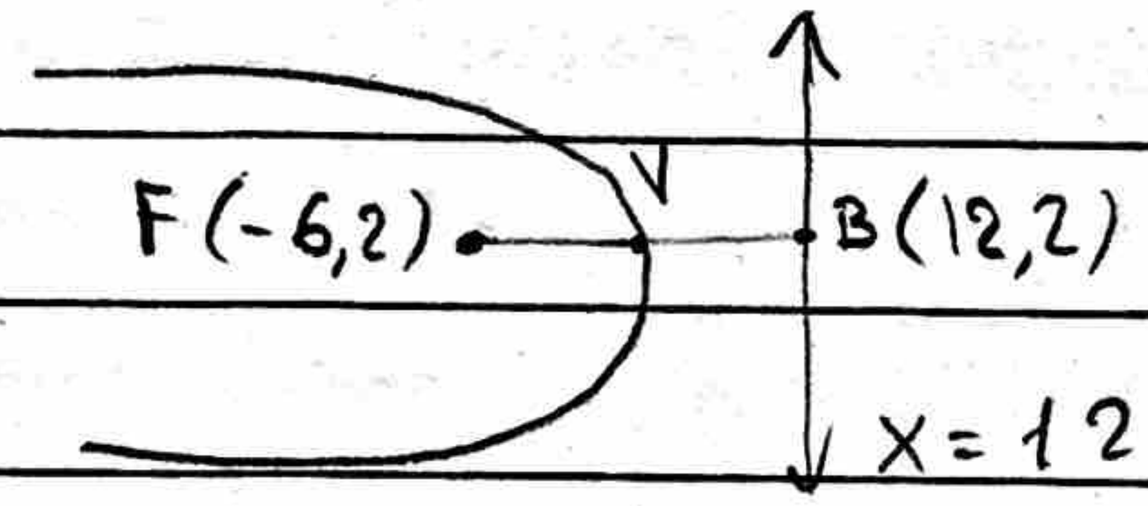
$V(4,-2)$

i)



ii) $V(4,-2)$ iii) $F(4,-5)$ iv) $y=1$.

Q2. $F(-6,2)$; directrix $x=12$ eqn=? $4d(x-x_0)=(y-y_0)^2$



$(d<0)$

$V(3,2)$

$|d|=|VF|=|VB|$

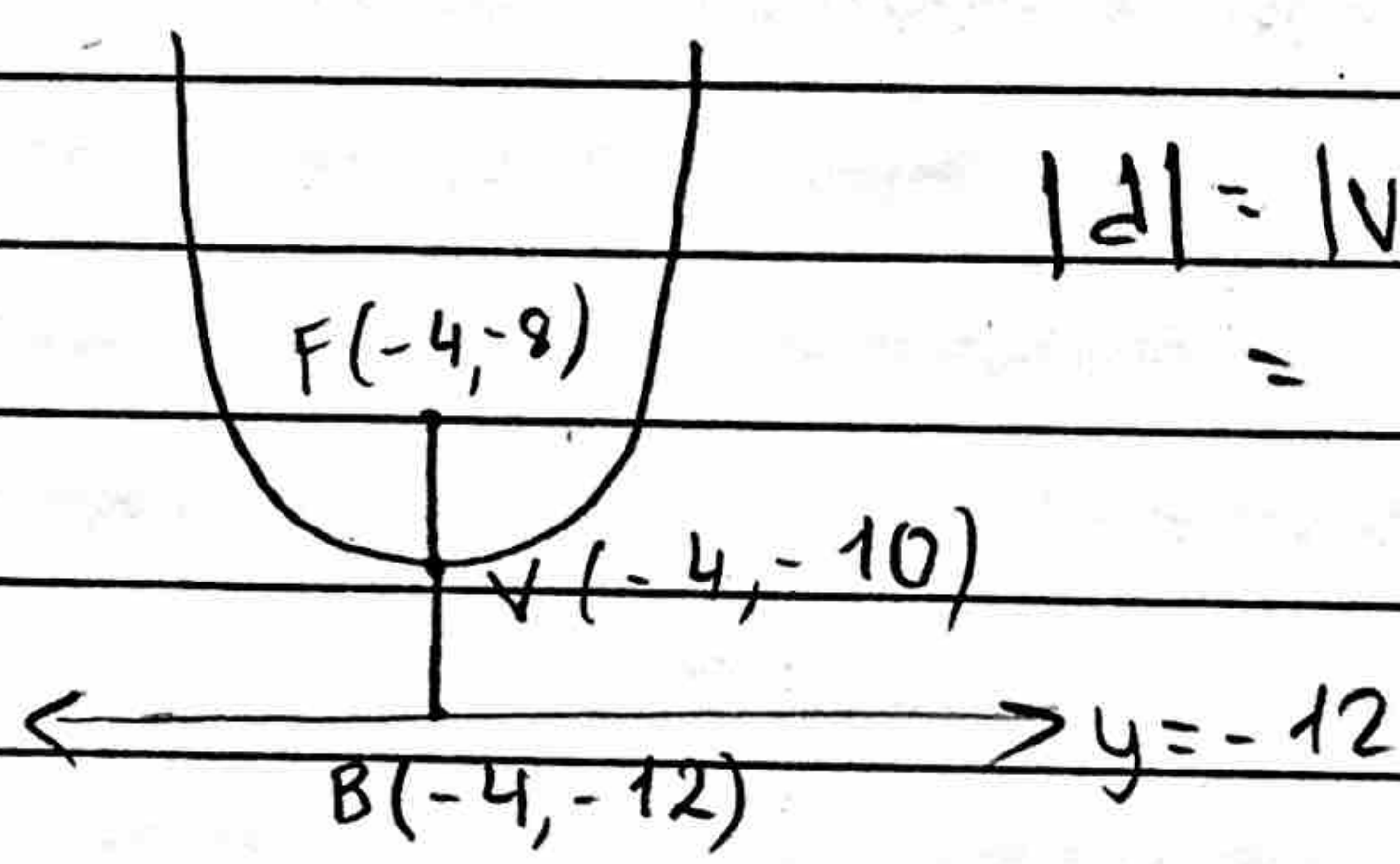
$=9$

$\Rightarrow \boxed{-36(x-3)=(y-2)^2}$

Q3. $F(-4,-8)$ eqn=?

directrix $y=-12$

$4d(y-y_0)=(x-x_0)^2$



$|d|=|VF|=|VB|$

$=2$

$\Rightarrow \boxed{8(y+10)=(y+4)^2}$

$(d>0)$

Nour ElBery 72631

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Questions

1- $2y = 3x^2 + 12x + 4$

a) write in SF
b) sketch
c) find focus, vertex and directrix line

2- $x = -5y^2 - 20y + 12$

a) write in SF
b) sketch
c) find focus vertex and directrix line

Solution

1- a) $2y = 3x^2 + 12x + 4$

$2y = [3(x^2 + 4x)] + 4$

$2y = [3(x^{\cancel{2}} + 2)^2 - 4] + 4$

$2y = 3(x+2)^2 - 12 + 4$

$2y = 3(x+2)^2 - 8$

$\frac{1}{2}(2y + 8) = 3(x+2)^2$

$y + 4 = \frac{1}{2}[3(x+2)^2]$

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

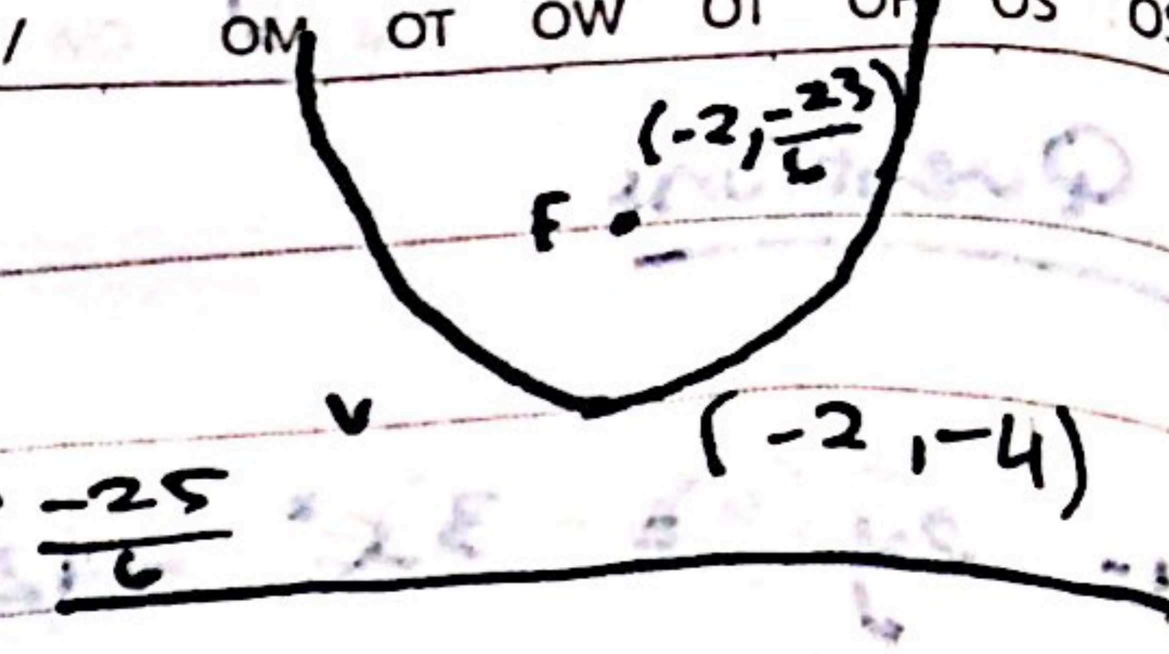
$\frac{2}{3}(y+4) = (x+2)^2$

Her solution is correct, but here is a diff.way

2y = 3(x+2)^2 - 8
2y + 8 = 3(x+ 2)^2
2(y + 4) = 3(x+2)^2
2/3(y + 4) =(x+2)^2
4d = 2/3, so d = 2/12 = 1/6

Now continue ....

NOTES DATE / /



b- vertex $= (-2, -4)$

$4D = \frac{2}{3}$ $D = \frac{1}{6}$

Focus $= \left(-2, \frac{-23}{6}\right)$

Directrix line goes throug ~~(-2, -25/6)~~ $y = \frac{-25}{6}$

Q. $x = -5y^2 - 20y + 12$

a) $x = \left[-5(y^2 + 4y)\right] + 12$

$x = \left[-5(y+2)^2 - 4\right] + 12$

$x = -5(y+2)^2 + 20 + 12$

$x = -5(y+2)^2 + 32$

$-\frac{1}{5} \times (x - 32) = \frac{-5(y+2)^2}{-5}$

$-\frac{1}{5}(x - 32) = (y+2)^2$

~~goes throug~~ x line: ~~up~~ to the righ

$4D = -\frac{1}{5}$

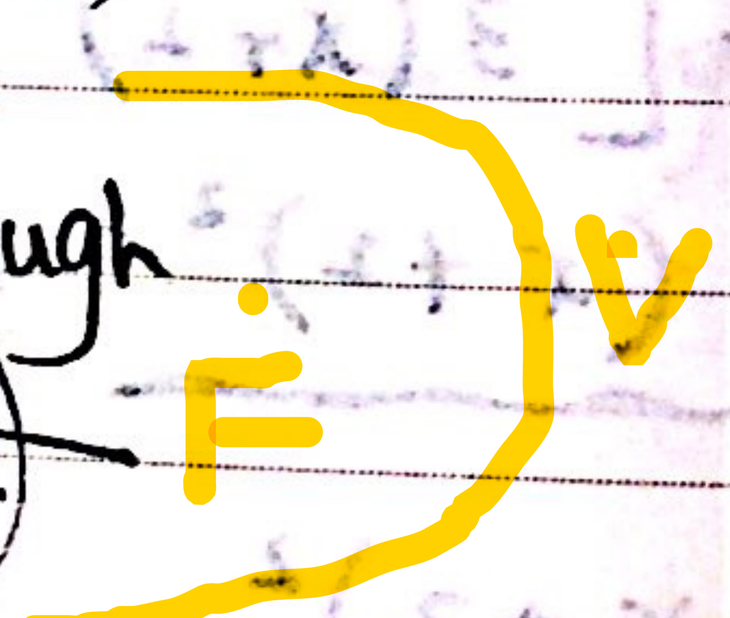
$D = -0.05 = -\frac{1}{20}$

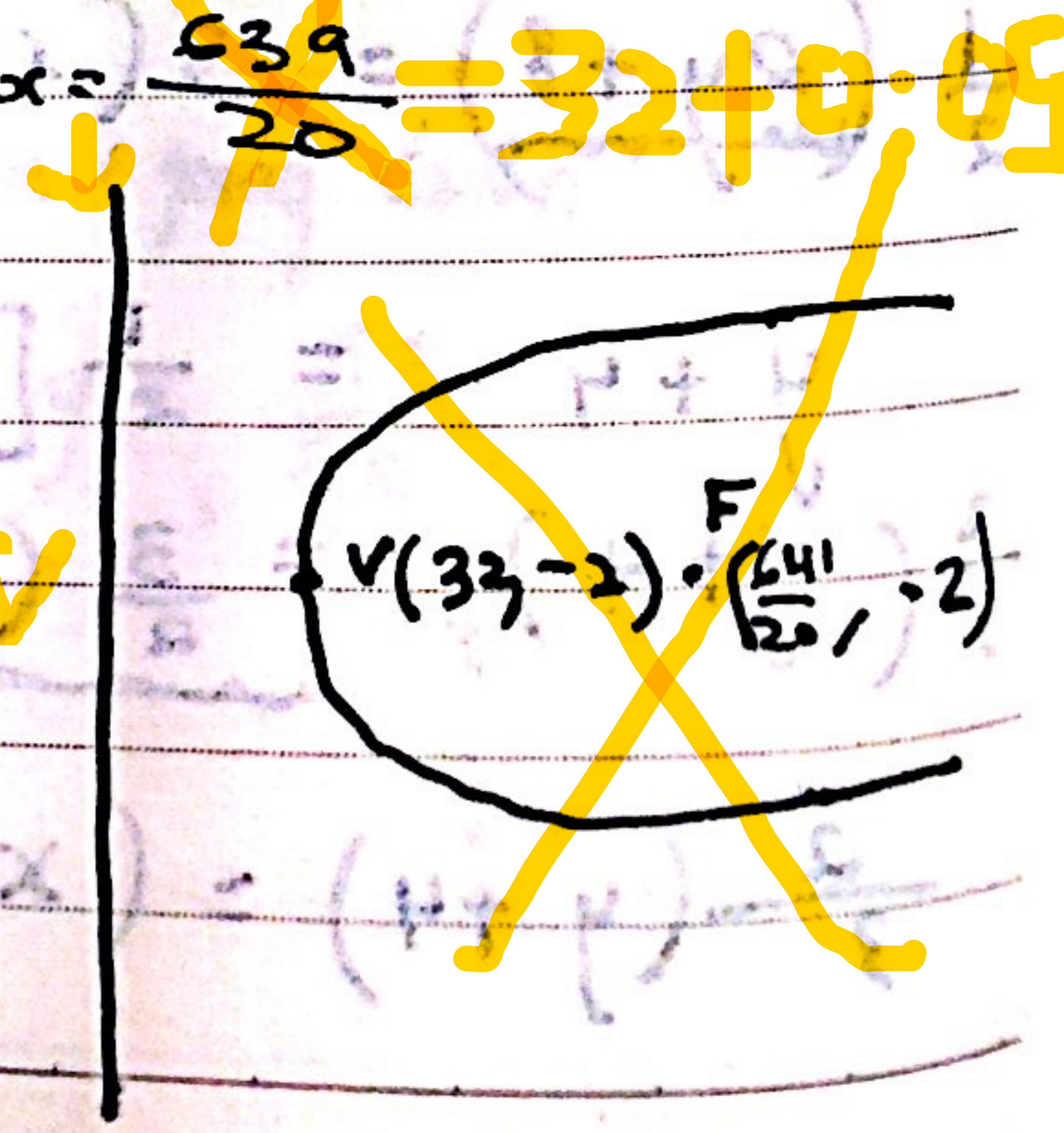
b) vertex $= (32, -2)$ ✓

focus $= \left(\frac{641}{20}, -2\right)$ $32 - 0.05$

directrix line goes through

$x = \left(\frac{639}{20}\right)$ ~~$x = \left(\frac{639}{20}, -2\right)$~~





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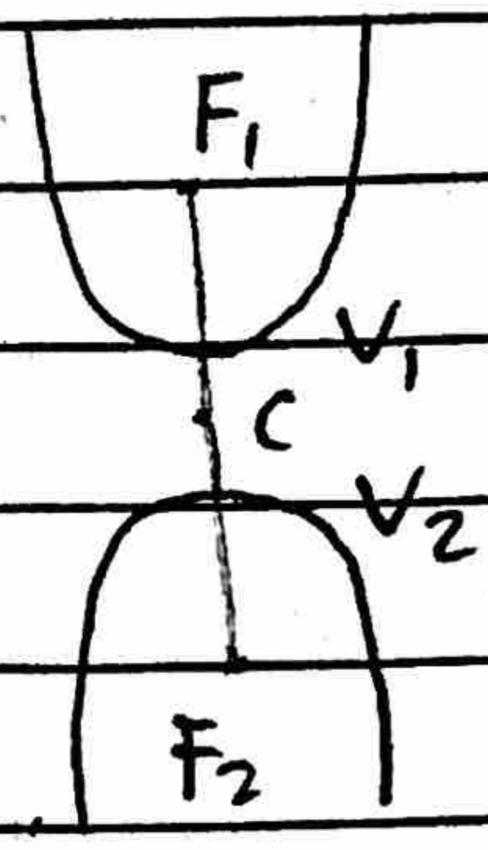
4.02.2018

~~Q1.~~ $\frac{(y-1)^2}{16} - \frac{x^2}{9} = 1.$



~~1~~- sketch
~~2~~- Foci ?
~~3~~- vertices ?
~~4~~- k ?

$\left(\frac{k}{2}\right)^2 = 16 \Rightarrow \frac{k}{2} = 4$

$\Rightarrow \boxed{k = 8}$

$b^2 = 9 \Rightarrow b = 3.$

$C(0,1)$

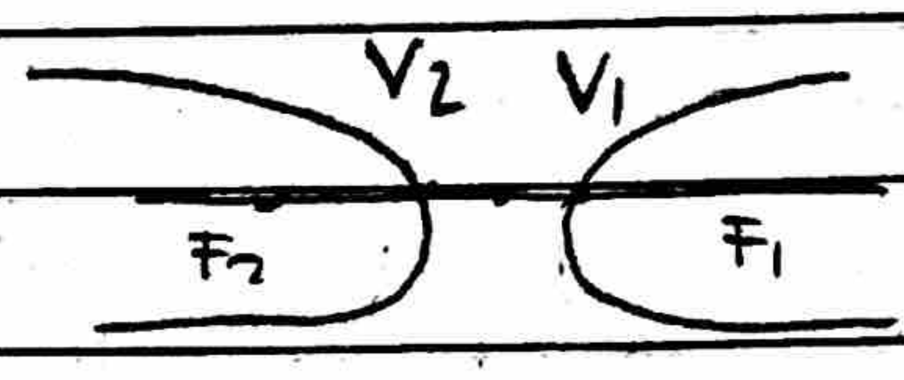
$V_1(0, 1+4) \quad V_2(0, 1-4)$

$\boxed{V_1(0,5)} \quad \boxed{V_2(0,-3)}$

$|CF_1| = \sqrt{16+9} = 5 \Rightarrow F_1(0, 1+5) \quad F_2(0, 1-5)$

$\boxed{F_1(0,6)} \quad \boxed{F_2(0,-4)}$

~~Q2.~~ $(x+4)^2 - \frac{(y-5)^2}{3} - 1$



$C(-4,5)$

$\left(\frac{k}{2}\right)^2 = 1 \Rightarrow \frac{k}{2} = 1 \Rightarrow \boxed{k=2}$

$b^2 = 3 \Rightarrow b = \sqrt{3}$

$C(-4,5)$

$V_1(-4+1, 5) \quad V_2(-4-1, 5)$

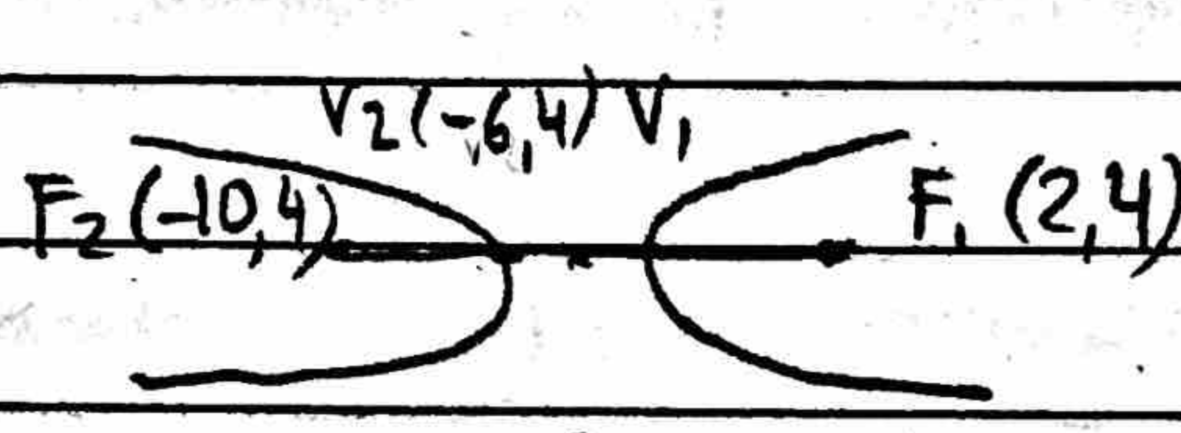
$\boxed{V_1(-3,5)} \quad \boxed{V_2(-5,5)}$

$|CF_1| = \sqrt{1+3} = 2 \Rightarrow F_1(-4+2, 5) \quad F_2(-4-2, 5)$

$\boxed{F_1(-2,5)} \quad \boxed{F_2(-6,5)}$

Q3. $F_1(2,4) \quad F_2(-10,4) \quad V_2(-6,4)$

a) $k=?$ b) $V_1 = ?$ c) eqn=?



$C(-4,4)$

$C(-4,4) \qquad |CV_2| = \frac{k}{2} = 2 \Rightarrow \boxed{k=4}$

$|CV_1| = |CV_2| = \frac{k}{2}$

$\Rightarrow \boxed{V_1(-2,4)} \qquad b^2 = |CF_2|^2 - \left(\frac{k}{2}\right)^2 = 6^2 - 2^2 = 32.$

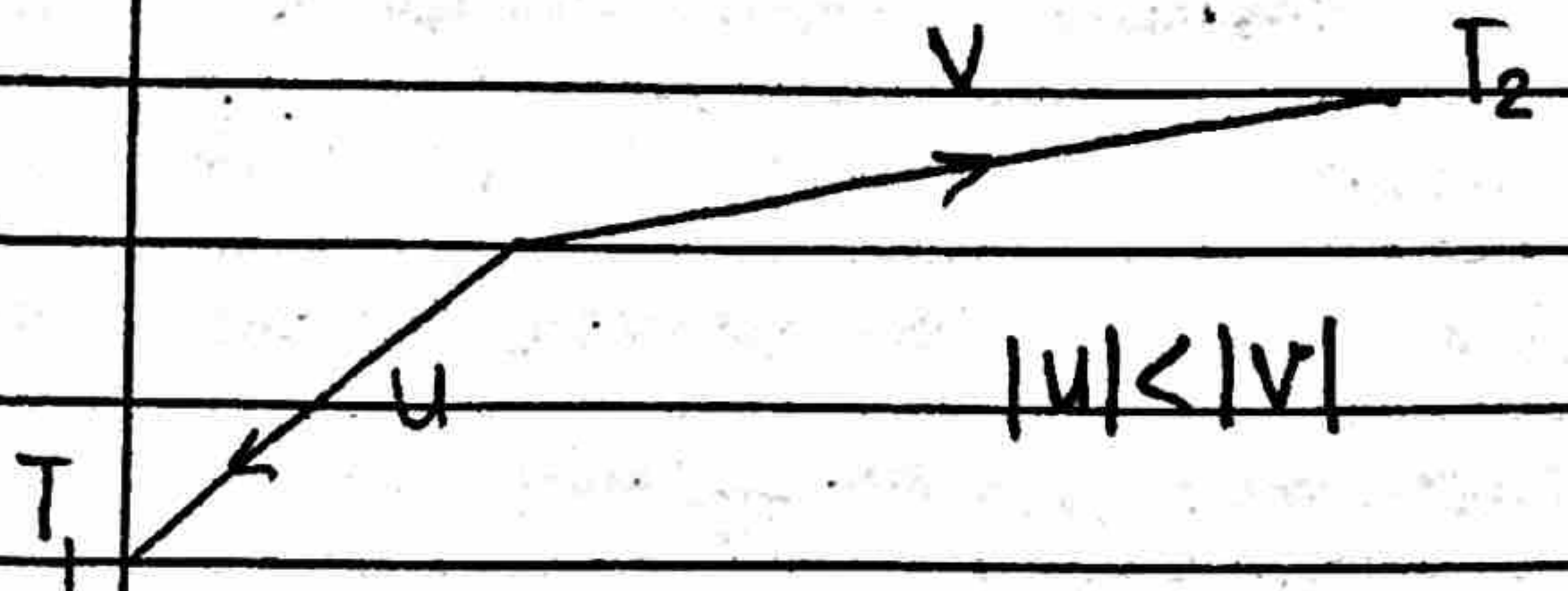
$|CF_2| = 6$

$$\boxed{\frac{(x+4)^2}{4} - \frac{(y-4)^2}{32} = 1}$$

NADIN ELSHIRBINI 72434

HW 5. 11/02/2018

1.

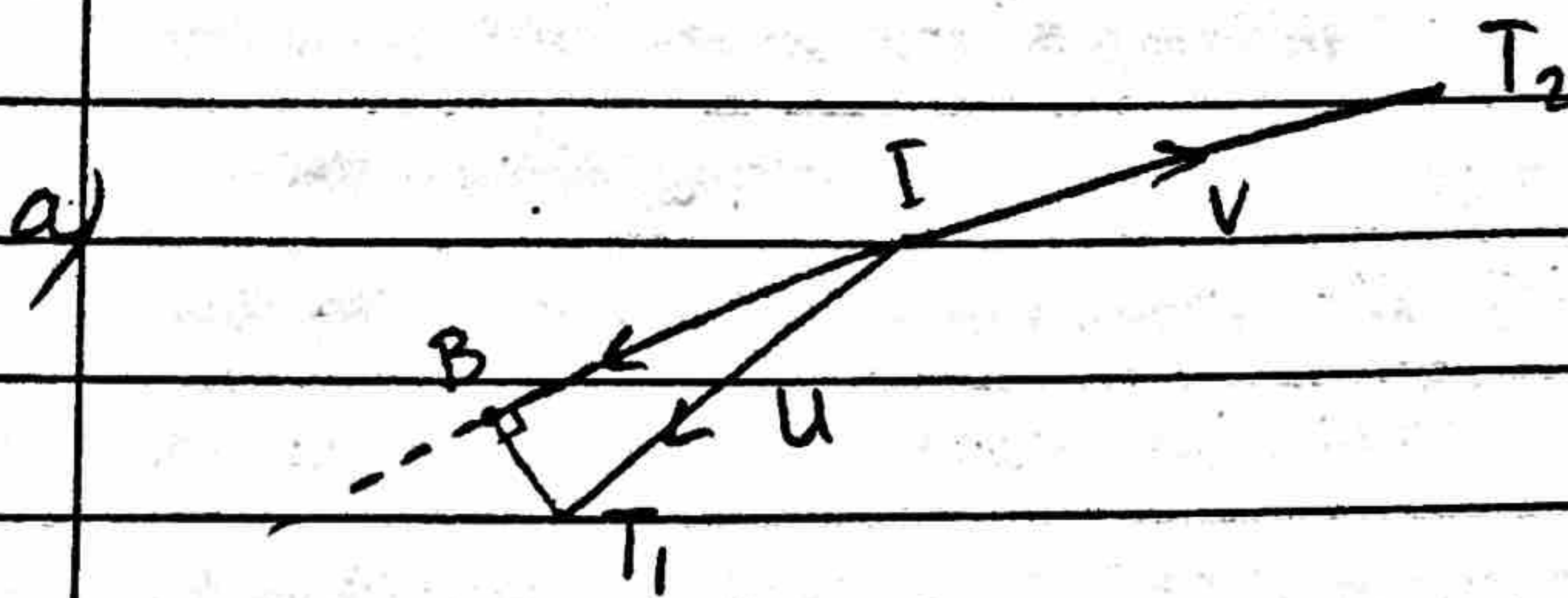


a) Draw proj_{v}^{u}

b) Draw proj_{u}^{v}

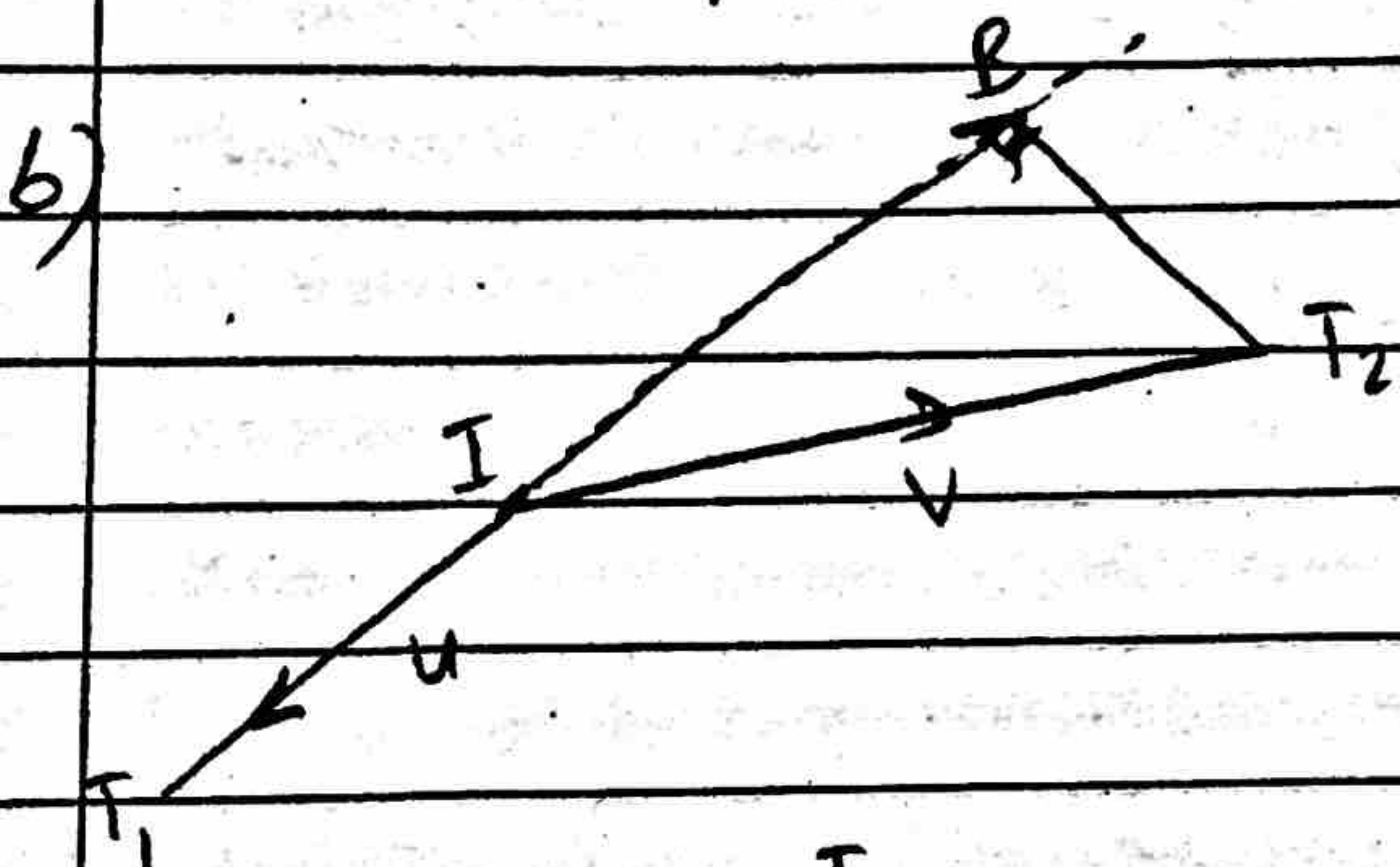
$|u|<|v|$

a)



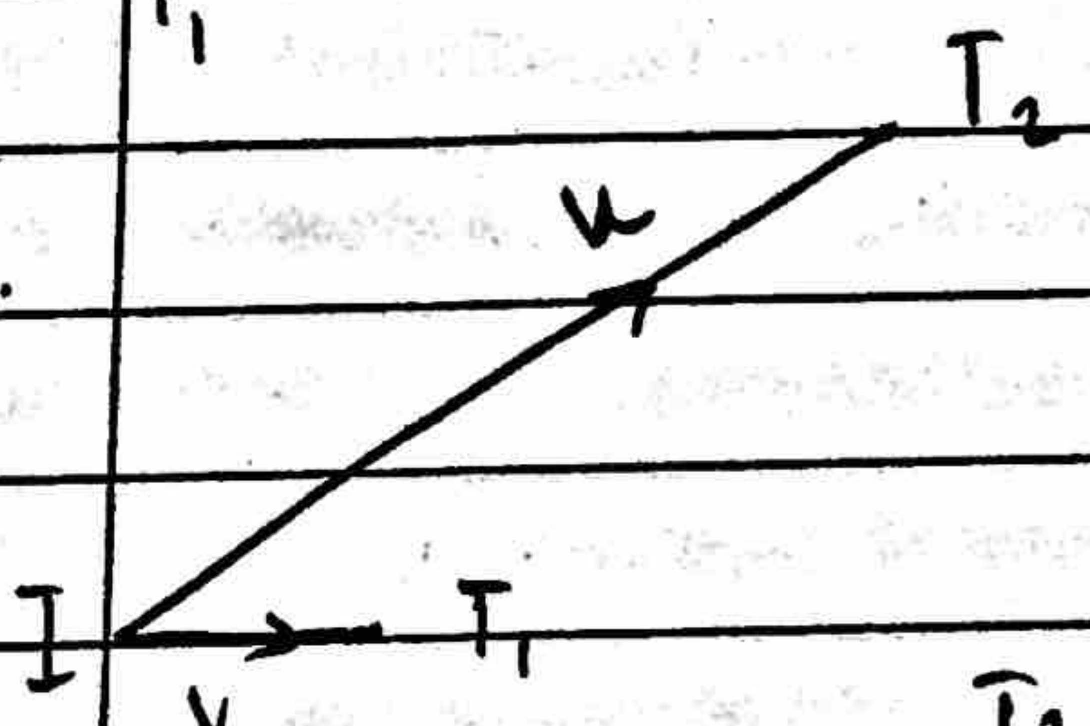
$\text{proj}_{v}^{u} = \overrightarrow{IB}$

b)



$\text{proj}_{u}^{v} = \overrightarrow{IB}$

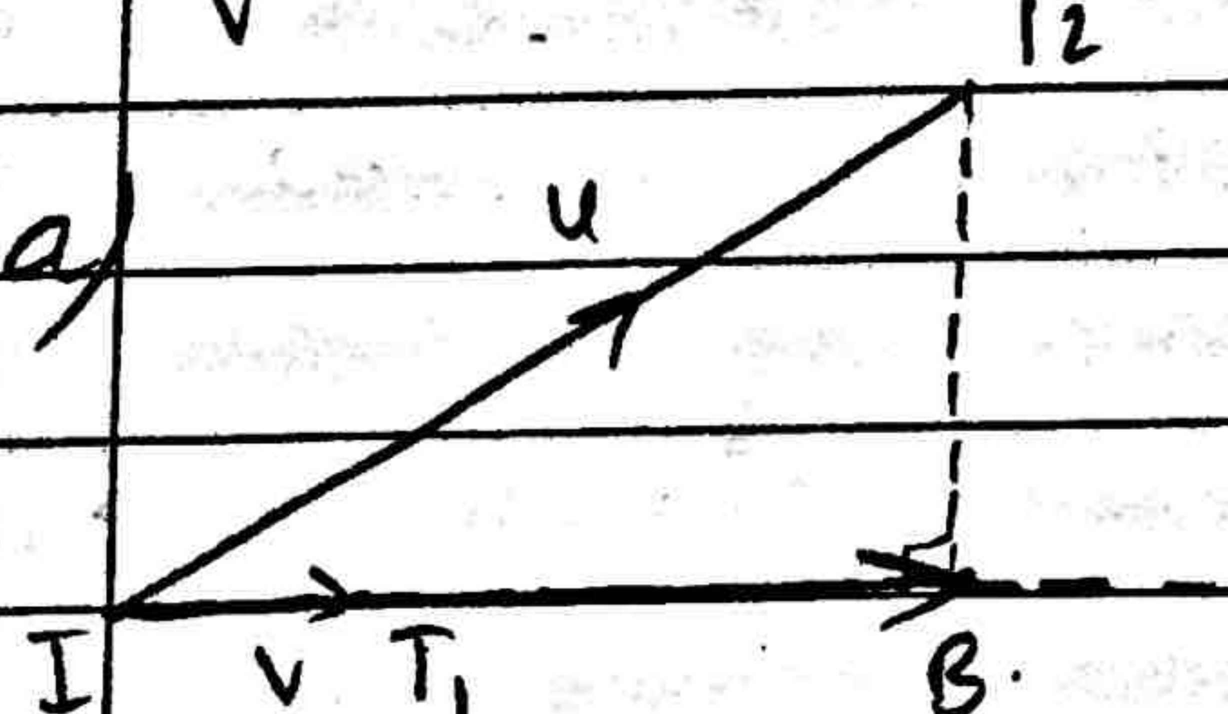
2.



a) Draw proj_{v}^{u}

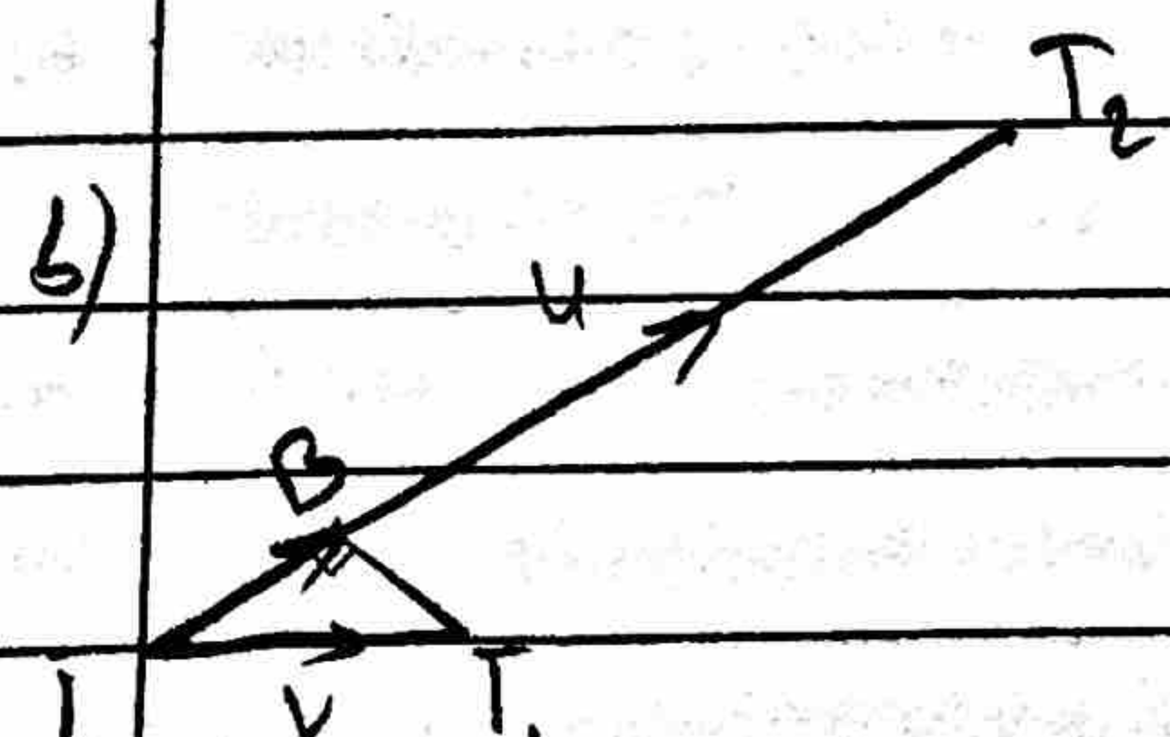
b) Draw proj_{u}^{v}

a)



$\text{proj}_{v}^{u} = \overrightarrow{IB}$

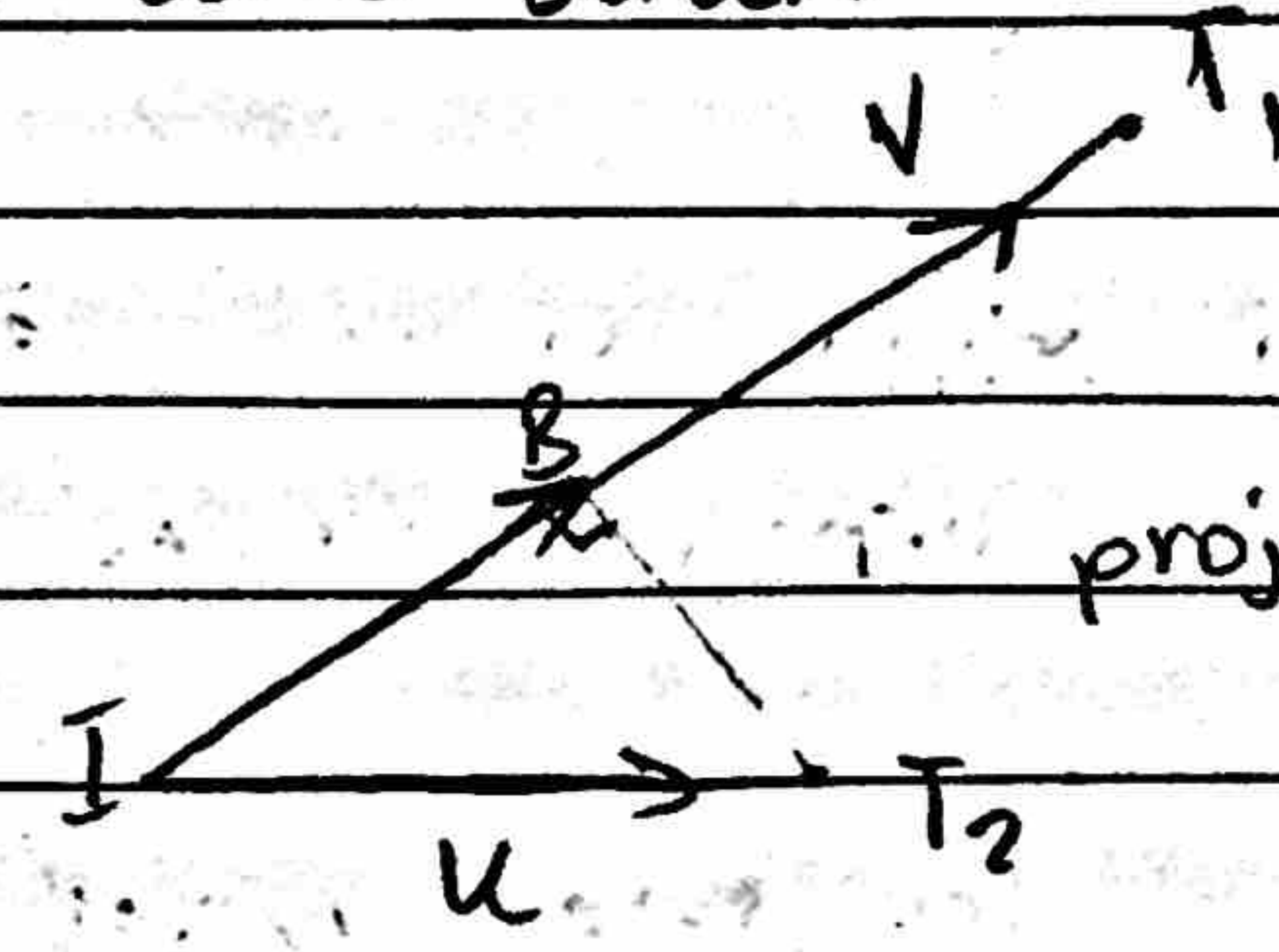
b)



$\text{proj}_{u}^{v} = \overrightarrow{IB}$

3. $u \langle 1,4,6 \rangle$ Find $proj_v^u$ and draw

$v \langle -2,10,1 \rangle$



$proj_v^u = \overrightarrow{IB}$

$$proj_v^u = \frac{u \cdot v}{|v|^2} \cdot v$$

$u \cdot v = 1(-2) + 4(10) + 6(1) = 44$

$|v| = \sqrt{2^2 + 10^2 + 1^2} = \sqrt{105}$

$$proj_v^u = \frac{44}{105} \cdot v = \frac{44}{105} \langle -2, 10, 1 \rangle = \left\langle -\frac{88}{105}, \frac{88}{21}, \frac{44}{105} \right\rangle$$

Nour Elbery

NOTES

Q) Given $\Delta = \langle -4, 7, 2 \rangle$ is the directional vector of line L and $(2, -4, 10)$ lies on L

1- find parametric eqn of L

$2 - 4L \quad -4 + 7L \quad 10 + 2L$

~~2 - 4L, 7 - 4L~~

$x = 2 - 4L$

$y = -4 + 7L$

$z = 10 + 2L$

$\frac{4L}{4} = \frac{2 - x}{4} \qquad \frac{7L}{7} = \frac{y + 4}{7} \qquad \frac{2L}{2} = \frac{z - 10}{2}$

$L = \frac{2 - x}{4} \qquad L = \frac{y + 4}{7} \qquad L = \frac{z - 10}{2}$

2. find symmetric eqn of L

$$\frac{2 - x}{4} = \frac{y + 4}{7} = \frac{z - 10}{2}$$

3. Does $(-2, 3, 12)$ lie on L

$\frac{2 - (-2)}{4} = 1$

$\frac{3 + 4}{7} = 1$

$\frac{12 - 10}{2} = 1$

yes they lie on ~~same~~ L as all L values are the same

Q. Given $(1,2,4)$ and $(-10,3,0)$ on line L

parametric eqn =

$$(-10-1,\ 3-2,\ 0-4) = (-11,\ 1,\ -4)$$

$$\langle -11, 1, -4 \rangle \qquad (1,2,4)$$

$$x = 1 - 11t$$
$$y = 2 - t$$
$$z = 4 + 4t$$

$$\frac{11t}{11} = \frac{1-x}{11} \qquad t = 2-y \qquad \frac{4t}{4} = \frac{z-4}{4}$$

$$t = \frac{1-x}{11} \qquad\qquad t = \frac{z-4}{4}$$

Symmetric eqn =

$$\frac{1-x}{11} = 2-y = \frac{z-4}{4}$$

NOTES DATE / /

Q: Given $w = \langle 1, 4, 7 \rangle$
$v = \langle -4, 2, -10 \rangle$

find $|\text{proj}_v w|$ & $|\text{proj}_w v|$

a) $$|\text{proj}_v w| = \frac{|w \cdot v|}{|v|}$$

$$= \frac{|-4 + 8 - 70|}{\left(\sqrt{4^2 + 2^2 + 10^2}\right)} = \frac{66}{2\sqrt{30}}$$

$$= \boxed{\frac{11\sqrt{30}}{10}}$$

b) $$|\text{proj}_w v| = \frac{|v \cdot w|}{|w|} = \frac{66}{}$$

$$= \frac{\cancel{66}}{\cancel{66}} \quad \text{EU}$$

$$\frac{66}{\sqrt{4^2 + 1^2 + 7^2}} = \boxed{\sqrt{66}}$$

Leen AlNimer

HW Q1) $L_1: x = 4t-1$

$y = 2t+2$ $\quad t \in \mathbb{R}$

$z = 10$

$L_2: x = 3w-6$

$y = -2w+10$ $\quad w \in \mathbb{R}$

$z = 3w+1$

$4t-1 = 3w-6$

$4t-3w = 1-6$

$3w+1 = 10$

$3w = 9$

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$$4t - 3\cancel{w} = -5$$
$$3\cancel{w} = 9$$

$$4t = 4$$
$$t = 1$$

$$4(1) - 3w = -5$$
$$w = 3.$$

$t=1 \longrightarrow (3,4,10)$

$w=3 \longrightarrow (3,4,10)$

We may assume that the two airplanes took off from two different airport at the same time!! So Plane 1 will reach the point (3, 4, 10) after one hour, where Plane 2 will arrive

~~Both planes will arive at the same point (3,4,10) at the same time~~

at the same point after 3 hours. Hence no COLLISION

Q2. $L_1: x = 4t - 1$

$y = 2t + 2 \qquad t \in R$

$z = 4t + 3$

$L_2: x = 3w - 6$

$y = -2w + 10 \qquad w \in R$

$z = 3w + 1$

$$4t - 1 = 3w - 6$$
$$4t - 3w = 1 - 6$$

$$2t + 2 = -2w + 10$$
$$2t + 2w = -2 + 10$$

$$4t - 3w = -5$$
$$-2(2t + 2w = 8)$$

$$\cancel{4t} - 3w = -5$$
$$-\cancel{4t} - 4w = -16$$

$$-7w = -21$$
$$w = 3$$

$4t - 3(3) = -5$

$t = 1$

$t=1 \rightarrow (3,4,7)$ don't intersect

$w=3 \rightarrow (3,4,6)$ because $7 \neq 6$.

Name——————————————, ID ———————

HW 8: MTH 111, Spring 2018

Ayman Badawi

QUESTION 1. Given $L_1 : x = 2t + 1, y = -4t + 6, z = 7t + 3$ and $L_2 : x = 6w - 9, y = -12w + 26, z = -21w + 30$. Convince me that L_1 is not parallel to L_2. Also,does L_1 intersect L_2?

Solution: $D_1 =< 2, -4, 7 >, D_2 =< 6, -12, -21 >$**. Set** $D_1 = cD_2$**, so** $< 2, -4, 7 >= c < 6, -12, -21 >=< 6c, -12c, -21c >$**. Hence** $2 = 6c$ **implies c = 1/3; -4 = -12c implies c = 1/3 (so far so good since we are getting the same value for c); 7 = -21c implies c = -1/3..whips not good, so we cannot find one value for c to make** $D_1 = cD_2$**. Hence stop,** L_1 **is not parallel to** L_2**.**

Let us check if L_1 **intersects** L_2**. Make x in** L_1 **= x in** L_2 **and make y in** L_1 **= y in** L_2**. We get the following two equations (after moving around)**

$$2t - 6w = -10$$

$$-4t + 12w = 20$$

. We multiply equation (1) with 2, then we add both equations. We get 0 = 0. Bad Luck (sad face). So we set x in L_1 **= x in** L_2 **and z in** $L_1 = z$ **in** L_2

$$2t - 6w = -10$$

$$7t + 21w = 27$$

Multiply the first equation with -3.5 **and then we add both equations. We get 42w = 62. Hence w = 31/21. Substitute for w in one of the equations (I choose second equation), we get t = -4/7. Now if** L_1 **intersect** L_2**, then y-value of** L_1 **when t = -4/7 must equal y-value of** L_2 **when** $w = 31/21$**.**

$y = -4t + 6$ **in** L_1**, so substitute** $t = -4/7$**, we get** $y = 8.286$ **(approx),** $y = -12w + 26$ **in** L_2**, so substitute w = 31/21, we get** $y = 8.286$ **(approx).**

Thus L_1 **indeed intersect** L_2**. So now to find the point of intersection. Let** $t = -4/7$ **find x, y, z from** L_1**. (you may choose w = 31/21, find x, y, z in** L_2**, you must get the same point). we get (-0.143, 8.286, -1)**

QUESTION 2. $L_1 : x = 2t + 1, y = -4t + 6, z = 7t + 3$ and $L_2 : x = 6w - 9, y = -12w + 26, z = 21w - 30$. Convince me that L_1 is parallel to L_2 (Hint: Another method to solve this question (I gave it last semester, but students seem were not convinced !): First Check if $D_1 = cD_2$ for some number c. If no, then stop and we conclude that they are not parallel. If yes, then choose a point Q randomly on L_1 (Here you may choose Q = (1, 6, 3). If Q lies on L_2, then L_1 lies on top of L_2 and in this case they are not parallel. 2) If Q does not lie on L_2, then L_1 is parallel to L_2.

Solution: $D_1 =< 2, -4, 7 >$ **and** $D_2 =< 6, -12, 21 >$**. Set** $D_1 = cD_2$**. One can conclude that** $c = 1/3$**. Thus** D_1 **is parallel to** D_2**. So we continue. Let** $t = 0$ **in** L_1**. We get the point** $Q = (1, 6, 3)$**. Now check if** Q **lies on** L_2**. Set 1 = 6w - 9, we get w = 10/6 = 5/3. Set 6 = -12w + 26, we get w = 20/12 = 5/3 (so far so good, we getting the same value for w). Set 3 = 21w - 30, we get w = 33/21 = 11/7, whips... not good. So** L_1 **is parallel to** L_2

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Nadin El Shirbini

She made a mistake in calculating V in question one (no big deal), take Q_2 on L_2, say Q_2 = (-17, 38, 2). Then V = QQ_2 = <-18, 36, -1>. So the answer is wrong but the IDEA (method) is correct

1. $L_1: \begin{cases} x = 2t+1 \\ y = -4t+2 \\ z = 7t+3 \end{cases}$ $L_2: \begin{cases} x = 6w-17 \\ y = -12w+38 \\ z = 21w+2 \end{cases}$

$D_2 \langle 6, -12, 21 \rangle$

$V \langle 16, 36, -1 \rangle$.

$Q(1,2,3) \in L_1$

$V \times D = \langle 744, -342, 408 \rangle$

$|QL_2| = |L_1 L_2| = \dfrac{|V \times D|}{|D|} \approx \cancel{\boxed{36.71 \text{ units}}}$

$|V \times D| \approx 914.86$

$|D| = 3\sqrt{69}$

Choose a point I on L. Say (-17, 38, 2). Then QI = V as below, note that if you do IQ, then you get the vector <24, -36, 0>. This will not affect the final answer

2. $L: \begin{cases} x = 6w-17 \\ y = -12w+38 \\ z = 21w+2 \end{cases}$

$Q(7,2,2)$

$D \langle 6, -12, 21 \rangle$ $V \langle -24, 36, 0 \rangle$

$V \times D = \langle 756, 504, 72 \rangle$ $|V \times D| = 36\sqrt{641}$

$|QL_2| = \dfrac{|V \times D|}{|D|} \approx \boxed{36.58 \text{ units}}$ $|D| = 3\sqrt{69}$.

3. $L: -4x + 3y = 9$ $Q(4,-6)$ See my comments:

She used diff. method which is correct.
The method we used is 1) -4x + 3y - 9 = 0

2) Substitute 4 for x and -6 for y, we get |QL| = |-16 - 18 -9| / sqrt{16 + 9} = 43/5

~~$I(0,3,0)$ $\vec{IQ} \langle 4, -9, 0 \rangle$~~ $N \langle -4, 3, 0 \rangle$

~~$|QL| = \dfrac{|\vec{IQ} \cdot N|}{|N|} = \dfrac{|4(-4) - 9(3)|}{5} = \boxed{\dfrac{43}{5} \text{ units.}}$~~

4. a) $Q_1(2,2,2)$ $Q_2(4,4,4)$ $Q_3(8,7,6)$

$\vec{Q_1Q_2} \langle 2,2,2 \rangle$ $\vec{Q_1Q_3} \langle 6,5,4 \rangle$

$N = \vec{Q_1Q_2} \times \vec{Q_1Q_3} = \langle -2, 4, -2 \rangle$

equation of plane:

$$\boxed{-2(x-2) + 4(y-2) - 2(z-2) = 0}$$

b) $P: 2x + y + 2z = 20$ $|N| = 0.025$

$N \langle 2,1,2 \rangle$ $\dfrac{0.025}{3} \langle 2,1,2 \rangle$ $\Rightarrow$ $\boxed{N = \left\langle \dfrac{2}{120}, \dfrac{1}{120}, \dfrac{2}{120} \right\rangle}$

$|N| = 3$.

c) $P: 2x + y + 2z = 20$ $V \langle -4, 0, 6 \rangle$

$N \langle 2,1,2 \rangle$

$N \cdot V = 4 \neq 0 \Rightarrow$ The vectors are not $\perp$ $\Rightarrow$ You can't draw it inside the plane.

d) $Q(20, 10, -12.5)$

P: $2x + y + 2z = 20$. $N\langle \cancel{2, 0,} 2\rangle$

I $(0, 0, 10)$ $\vec{IQ}\langle 20, 10, -22.5\rangle$

$|QP| = \dfrac{|\vec{IQ} \cdot \vec{N}|}{|N|}$ $\dfrac{5}{\cancel{2\sqrt{2}}}$ units

She used Diff. Method which is correct (but her N is false, note that

N = <2,1, 2>. Our method is

1) 2x + y + 2z - 20 = 0 and N = <2, 1, 2>. 2) Substitute 20 for x, 10 for y

and

-12.5 for z, so |QP| = |40 + 10-25 - 20|/ |N| = 5/sqrt{4 + 1 + 4} = 5/3 units

Leen Alnimer

HW 10

Q1. $P_1: 3x+2y-z=-2$ $P_2: -2x-2y+4z=-4$

$N_1 \langle 3, 2, -1 \rangle$ $N_2 \langle -2, -2, 4 \rangle$

$$N_1 \times N_2 \begin{vmatrix} i & j & k \\ 3 & 2 & -1 \\ -2 & -2 & 4 \end{vmatrix} = \left\langle \begin{vmatrix} 2 & -1 \\ -2 & 4 \end{vmatrix}, \begin{vmatrix} 3 & -1 \\ -2 & 4 \end{vmatrix}, \begin{vmatrix} 3 & 2 \\ -2 & -2 \end{vmatrix} \right\rangle$$

$\langle 6, -10, -2 \rangle$ intersect.

Let $z=0$.

$3x+2y=-2$
$-2x-2y=-4$

$x=-6$

replace $\rightarrow 3(-6)+2y=-2$

$y=8$

$(-6, 8, 0)$ intersectional point

$(-6,8,0)+t\langle 6, -10, -2 \rangle$

Q2. $p: -3x+y+z=21$ $L: x=2t$
$y=4t+10$
$z=2t+5$

$D \langle 2, 4, 2 \rangle$

$-3(2t)+(4t+10)+(2t+5)=21$

$-6t+4t+10+2t+5=21$

$15 \neq 21$

This is good question. The line does not lie in the plane, but D can be drawn in the plane!

Can we Draw D inside the plane P?
N = <-3, 1, 1>.
D.N = 0. So yes we can.

Q3. $L: x = 2t+1$ $\quad p: 3x+2y-z=4$

$y = 4t-2$

$z = 5t+1$ $\quad$ Find Q (intersection point).

$3(2t+1)+2(4t-2)-(5t+1)=4$

$6t+3+8t-4-5t-1=4$

$\cancel{(3,-4,-1)}$ t = 2/3. Substitute 2/3 for t in L, we get (7/3, 2/3, 13/3)

Q4. $p_1: 3x+9y-3z=12$ $\quad N_1 \langle 3, 9, -3 \rangle$

$p_2: x+3y-z=4.$ $\quad N_2 \langle 1, 3, -1 \rangle.$

$$N_1 \times N_2 \begin{vmatrix} i & j & k \\ 3 & 9 & -3 \\ 1 & 3 & -1 \end{vmatrix} = \left\langle \begin{vmatrix} 9 & -3 \\ 3 & -1 \end{vmatrix}, -\begin{vmatrix} 3 & -3 \\ 1 & -1 \end{vmatrix}, \begin{vmatrix} 3 & 9 \\ 1 & 3 \end{vmatrix} \right\rangle$$

$\langle 0, 0, 0 \rangle$

$\cdot\ 3(1)+9(1)-3(0) = 12$

$(1,1,0)$ replace in

$x+3y-z=4$

$1+3(1)-0 \stackrel{?}{=} 4$

$4=4 \checkmark$ yes.

Q5. $p_1: x+2y-5z=7$

$p_2: -3x-6y+15z=-20.$

$N_1 \langle 1, 2, -5 \rangle$

$N_2 \langle -3, -6, 15 \rangle$

$$N_1 \times N_2 \begin{vmatrix} i & j & k \\ 1 & 2 & -5 \\ -3 & -6 & 15 \end{vmatrix}$$

$$= \left\langle \begin{vmatrix} 2 & -5 \\ -6 & 15 \end{vmatrix}, -\begin{vmatrix} 1 & -5 \\ -3 & 15 \end{vmatrix}, \begin{vmatrix} 1 & 2 \\ -3 & -6 \end{vmatrix} \right\rangle.$$

$\langle 0, 0, 0 \rangle$

$x + 2y - 5z = 7$ $\quad\quad$ $(5, 1, 0)$

$5 + 2(1) - 5(0) = 7$

$7 = 7$ replace in

$-3x - 6y + 15z = -20.$

$-3(5) - 6 + 15(0) \stackrel{?}{=} -20$

$-21 \neq -20$ parallel.

Another way, choose $y = z = 0$ in P1, hence $x = 7$. Thus (7, 0, 0) is in P1. Substitute 7 for x, 0 for y, and 0 for z in P2, we get -21 + 0 + 0 = -20 (invalid). Thus P1 parallel to P2

From: Leen Agha AlNimer
To: Ayman Badawi
Subject: Solution HW 11
Date: Wednesday, March 21, 2018 7:21:17 AM

v. $f(x) = 12x^4 + 10x^2 - 2018$, find $f'(-1)$

$f'(x) = 48x^3 + 20x - 0$

$f'(-1) = 48(-1)^3 + 20(-1)$

$f'(-1) = -48 - 20 = -68$

HW 11

Q1 i. $y = 5x^2 + 12x - 4\sqrt{x} + \frac{4}{x^5}$

$y = 5x^2 + 12x - 4x^{1/2} + 4x^{-5}$

$y' = 10x + 12 - 2x^{-1/2} - 20x^{-6} = 10x + 12 - \frac{2}{\sqrt{x}} - \frac{20}{x^6}$

ii. $y = \frac{x^2 + 10x - 5\sqrt{x}}{\sqrt[5]{x^2}}$

$y = x^2 + 10x - 5x^{1/2} + x^{-2/5}$ y = x^{8/5} + 10x^{3/5} -5x^{8/10}

$y' = 2x + 10 - \frac{5}{2}x^{-1/2} - \frac{2}{5}x^{-7/5}$ Now start cooking

$y' = 2x + 10 - \frac{5}{2\sqrt{x}} - \frac{2}{5x^{7/5}}$

iii. $y = 4x^2(x+3)^2 + 10x - 7$

$y = 4x^2(x^2 + 6x + 9) + 10x - 7$

$y = 4x^4 + 24x^3 + 36x^2 + 10x - 7$

$y' = 16x^3 + 72x^2 + 72x + 10 - 0$

iv. $f(x) = 8\sqrt{x} + \frac{32}{x}$, find $f'(4)$

$f(x) = 8x^{1/2} + 32x^{-1}$

$f'(x) = 4x^{-1/2} - 32x^{-2}$

$f'(x) = \frac{4}{\sqrt{x}} - \frac{32}{x^2}$

$f'(4) = \frac{4}{\sqrt{4}} - \frac{32}{4^2}$

$= \frac{4}{2} - \frac{32}{16}$

$f'(4) = 2 - 2 = 0$

Question 3 Let $f(x) = (x^2+4x+3)^{11}$

Reem Alali

i) Critical Values →

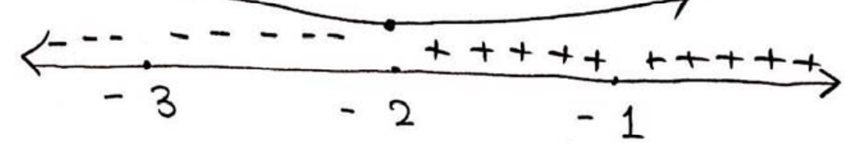
$f'(x) = 0$

$f'(x) = 11(x^2+4x+3)^{10} \cdot (2x+4)$

$(x^2+4x+3) = 0$ or $2x+4=0$

$(x+1)(x+3)$ $\quad$ $2x = -4$

① $\boxed{x=-1}$ ② $\boxed{x=-3}$ $\quad$ ③ $\boxed{x=-2}$



$f'(-4) < 0$

$f(-2.5) < 0$

$f(-1.5) > 0$

$f(0) > 0$

ii) * Increase: $(-2, \infty)$

* decrease: $(-\infty, -2)$

iii) No local max.

Local min at $\boxed{x=-2}$

iv) Sketch

4] $f(x) = 3x^2 + \sqrt[3]{2x+1} + 7x$, $x = 0$

• $f(0) = 3(0)^2 + \sqrt[3]{2(0)+1} + 7(0)$
$f(0) = 1$ $Q(0, 1)$

* eq. of the tangent line:
$y = mx + b$

to find m, → $f'(0)$

$f'(x) = 6x + \frac{1}{3}(2x+1)^{-\frac{2}{3}} \cdot (2) + 7$
$f'(x) = 6x + \frac{2}{3}(2x+1)^{-\frac{2}{3}} + 7$
$f'(0) = 6(0) + \frac{2}{3}(2(0)+1)^{-\frac{2}{3}} + 7$
$f'(0) = \frac{23}{3}$ → $m = \frac{23}{3}$

• Sub x & y (Q) to find b value.
$y = mx + b$ → $1 = \frac{23}{3}(0) + b$
$\boxed{1 = b}$

* equation of the tangent line:
$y = \frac{23}{3}x + 1$

* equation of the normal line $y = mx + b$

$\frac{23}{3}m = -1$ $\boxed{m = -\frac{3}{23}}$ $1 = \frac{-3}{23}(0) + b$ $\boxed{1 = b}$

$\boxed{y = -\frac{3}{23}x + 1}$

Reem Rashid Alleem

Homework 12

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

$y = x(x^4+6x^2+9$

$y = x^5+6x^3+9x$

$y' = 5x^4+18x^2+9$

2) $y = 3(2x+1)^{11} + \sqrt[5]{(2x^2+3x-2)} - 7x^4 + 2x^2 - 10$

$y = 3(2x+1)^{11} + (2x^2+3x-2)^{1/5} - 7x^4 + 2x^2 - 10$

$y' = 33(2x+1)^{10} \cdot (2) + \frac{1}{5}(2x^2+3x-2)^{-4/5} \cdot (4x+3) - 28x^3 + 4x$

3) $y = 12(\sqrt{x} + 2x+4)^{10}$

$y' = 120(\sqrt{x} + 2x+4)^9 \cdot (\frac{1}{2}x^{-1/2} + 2)$

MALAK ALHAWANDEH.

* If ln is inside → power rule.

* If outside. → normal

HW 15. LOGARITHMS.

1. $y = 3[\ln(2x+7)]^{10}$.

$3 \times 10 [\ln(2x+7)]^9$.

(When ln is inside).

→ $y' = 30 [\ln(2x+7)]^9 \times \frac{2}{2x+7}$.

2. $3 \ln(2x+7)^{10}$.

$30 \times \ln(2x+7) \rightarrow \frac{30(2)}{2x+7} \rightarrow \boxed{\frac{60}{2x+7}}$.

3. $y = ((x+1) \ln(3x-1)^3)$

$u \cdot v \rightarrow u'v + uv'$

$y' = (1) \ln(3x-1)^3 + (x+1) \cdot 3 \cancel{\ln} \frac{3}{3x-1}$.

$\boxed{y' = \ln(3x-1)^3 + 3x+3 \times \frac{3}{3x-1}}$.

4. $y = x \ln(2x+1)$

when $x = 2$.

$y = 2 \ln(2(2)+1)$. $y = 3.2$ $(2, 3.2)$.

$y = mx + c$.

$m = u \cdot v \rightarrow u'v + uv' \rightarrow \ln(2x+1) + x \times \frac{2}{2x+1} \rightarrow \ln(2x+1) + \frac{2x}{2x+1}$

$\ln(2(2)+1) + \frac{2(2)}{2(2)+1} = 2.4 \ldots$

$3.2 = 2.4(2) + c$

$3.2 = 4.8 + c$ $c = -1.6$.

$y = 2.4x - 1.6$.
EQUATION OF TANGENT.

EQUATION OF NORMAL.

$$m = -\frac{1}{2.4} \qquad y = mx + c.$$

$$3.2 = \left(-\frac{1}{2.4}\right)(2) + c$$

$$3.2 = -\frac{5}{6} + c \qquad c = \frac{121}{30}. \quad (\text{or } .4.0333 \ldots).$$

$$\boxed{y = -\frac{1}{2.4}x + \frac{121}{30}}$$

5. $y = (x+1) + \ln(3x-1)^3.$

$$1 + \frac{9 \text{ not } 3}{3x-1}.$$

6. $y = e^{(2x+1)} \times \ln(7x+2). \quad \rightarrow \quad u.v \rightarrow u'v + uv'$

$$y' = e^{(2x+1)} \times 2 \ln(7x+2) + e^{(2x+1)} \times \frac{7}{7x+2}.$$

7. $y = \log(\sqrt{x} + 3x - 1). \quad \rightarrow \quad \frac{\log a}{\log b} = \frac{\ln a}{\ln b}.$

$\downarrow$

$$y = \frac{\ln(\sqrt{x} + 3x - 1)}{\ln(10)} \quad \rightarrow \quad \ln(x^{1/2} + 3x - 1)$$

$$y' = \frac{\frac{\frac{1}{2}x^{-1/2} + 3}{x^{1/2} + 3x - 1}}{\ln(10).} \quad \rightarrow \quad \frac{\frac{1}{2}x^{-1/2} + 3}{x^{1/2} + 3x - 1} \times \frac{1}{\ln(10)}$$

Rana Hegab
Muhammad Farouqi
Olga Davidovskaya

HW : ①

$$\int \frac{2+4x}{x^{12}}\,dx = \int x^{-12}(2\cancel{x}+4x)\,dx$$

$$= \int 2x^{-12} + 4x^{-11}\,dx = \frac{-2}{11}x^{-11} + \frac{-4}{10}x^{-10} + C$$

$$= \frac{-2}{11x^{11}} - \frac{4}{10x^{10}} + C$$

②

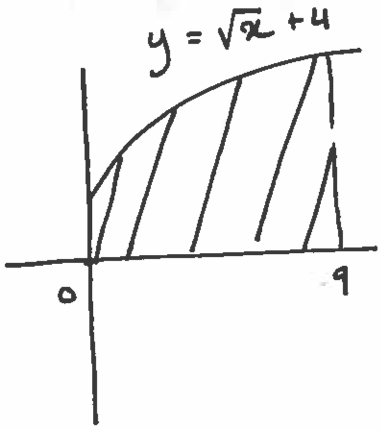
$$\int \frac{2x^2+2}{x^3+3x+7}\,dx = \frac{2}{3}\int 3 \cdot \frac{x^2+1}{x^3+3x+7}\,dx$$

$$= \frac{2}{3}\int 3(x^2+1)(x^3+3x+7)^{-1}\,dx = \frac{2}{3}\ln(x^3+3x+7)+C$$

③

$$\int (4x^3+e^x)\,e^{(x^4+e^x)}\,dx = e^{(x^4+e^x)} + C$$

④



$$\int_a^b f(x)\,dx = \int_0^9 \sqrt{x}+4\,dx$$

$$= \int_0^9 x^{+\frac{1}{2}} + 4\,dx = \frac{2}{3}x^{\frac{3}{2}} + 4x \Big|_0^9$$

$$= \left(\frac{2}{3}(9)^{\frac{3}{2}} + 4(9)\right) - \left(\frac{2}{3}(0)^{\frac{3}{2}} + 4(0)\right)$$

$$= \left(\frac{2}{3}(9)^{\frac{3}{2}} + 36\right) = 18 + 36 = 54\ \text{unit}^2$$

⑤ $\int w^2(2w+1)^2 dw = \int w^2(4w^2+4w+1)\,dw$

$= \int(4w^4+4w^3+w^2)\,dw = \frac{4}{5}w^5+\frac{4}{4}w^4+\frac{1}{3}w^3+C$

$= \frac{4}{5}w^5+w^4+\frac{1}{3}w^3+C$

⑥ $\int \frac{(4x+2)}{\sqrt{x^2+x+1}}\,dx = \int (4x+2)(x^2+x+1)^{-\frac{1}{2}}\,dx$

$= 2\int(2x+1)(x^2+x+1)^{-1/2}\,dx = \frac{2}{1/2}(x^2+x+1)^{1/2}+C$

$= 4(x^2+x+1)^{1/2}+C$