Homework due 9/20

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Sec. 12.3:

1) $4 \cdot 1 + 3 \cdot 2 + 5 \cdot 1 = 15$

13) $\cos\theta = \frac{-3}{\sqrt{3} \cdot \sqrt{9}}$ $\theta \approx 125^\circ$ Angle is obtuse

21) $\cos\theta = \frac{1}{\sqrt{2}\sqrt{5}} = \frac{1}{\sqrt{10}}$

29) a) $b + 3b + 2 = 0$ $b = -\frac{1}{2}$

b) $4b^2 - 2b = 0$ $b = 0$ or $b = \frac{1}{2}$

$b(4b - 2) = 0$

31) $\langle 3,0,2\rangle$ and $\langle 3,3,2\rangle$

57) $-4k$

63) $\overrightarrow{OP} = \frac{u\cdot v}{|v|^2}\vec{v} = \frac{34}{68}\langle 8,2\rangle$

$\overrightarrow{OP} = \langle 4,1\rangle \quad |OP| = \sqrt{17}$

Sec. 12.4

1) $1\cdot 3 - 4\cdot 2 = -5$

5) $1\cdot(-3) - 2\cdot 4 + 1\cdot 3 = -8$

13) $i - j$

21) $(u-2v)\times(u+2v) =$

$= u\times u + 2(u\times v) - 2(v\times u) - 4(v\times v)$

$= 0 + 2\langle 1, 1, 0\rangle + 2\langle 1, 1, 0\rangle + 0$

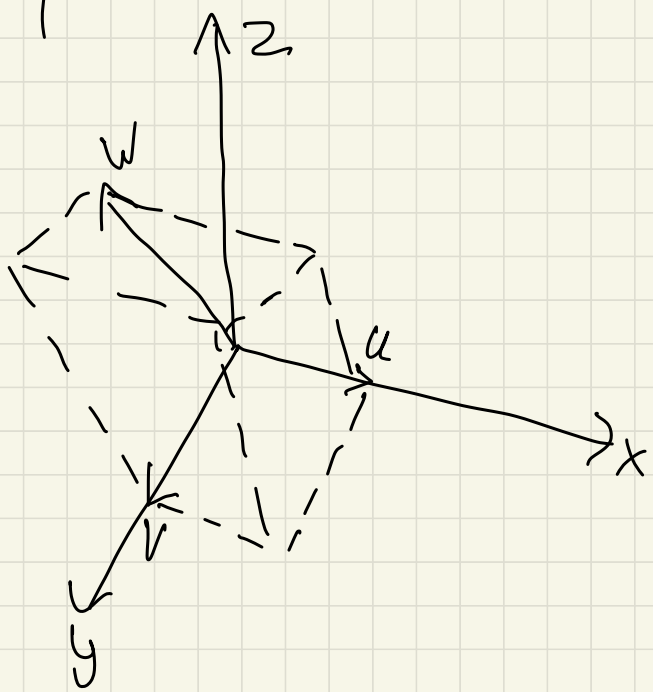
$= \langle 4, 4, 0\rangle$

25) $-u$ (according to right-hand rule)

27) $\langle 0, 3, 3\rangle$

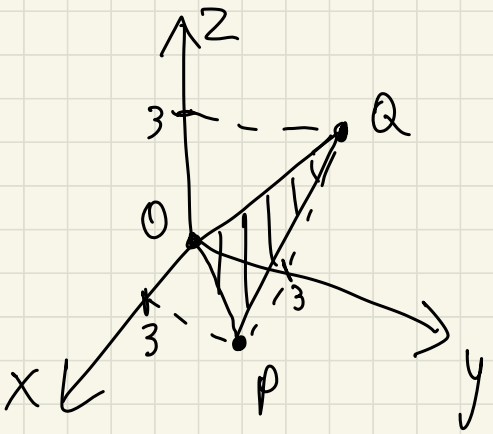
39) $V = |u \cdot (v \times w)| = |\langle 1, 0, 0\rangle \cdot \langle 4, 0, -2\rangle|$

$V = 4$



41) $A = |u \times v| = |\langle -3, 5, 1 \rangle| = \sqrt{35}$

43)



$$A = \frac{|OQ \times OP|}{2}$$

$$A = \frac{|\langle -9, 9, -9 \rangle|}{2}$$

$$A = \frac{\sqrt{81 \cdot 3}}{2} = \frac{9\sqrt{3}}{2}$$

45) $v_1 = \langle 2, 2 \rangle$

$v_2 = \langle -3, 0 \rangle$

$$A = \frac{|v_1 \times v_2|}{2}$$

$$A = \frac{|-6|}{2} = 3$$

Sec. 12.5

1) $1(x-4) + 3(y+1) + 2(z-1) = 0$

$x + 3y + 2z = 3$

5) $1(x-3)=0$ $\quad x=3$

9) $x+y+z=0$

11) (b) and (d)

13) $\langle 9,-4,-11\rangle$

15) $\langle 3,-8,11\rangle$

17) $PQ=\langle -1,2,-3\rangle$

$PR=\langle 1,2,-6\rangle$

$PQ \times PR=\langle -6,-9,-4\rangle$

Plane eq: $-6(x-2)-9(y+1)-4(z-4)=0$

$-6x-9y-4z=-19$

$6x+9y+4z=19$

19) $PQ = \langle -1, 1, 1 \rangle$

$PR = \langle 1, 0, 1 \rangle$

$PQ \times PR = \langle 1, 2, -1 \rangle$

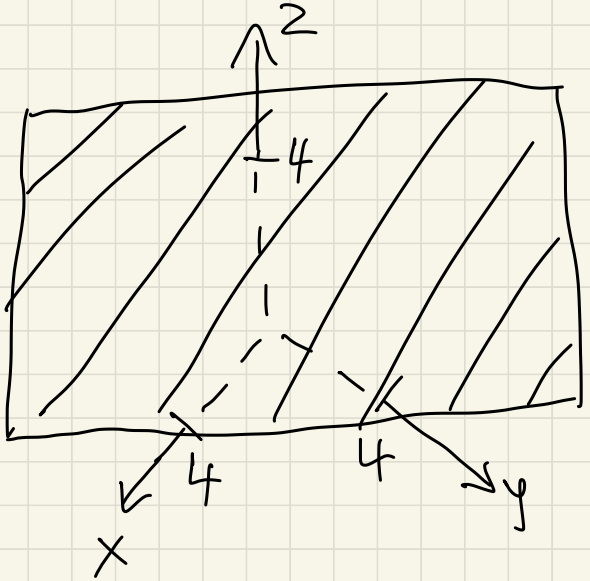
Plane eq: $1(x-1) + 2(y-0) - 1(z-0) = 0$

$x + 2y - z = 1$

25) $(x+2) + (z-5) = 0$

$x + z = 3$

31)



53) $3nx + ay + 2nz = 5n$, $a \in (-\infty, \infty)$

$n \in (-\infty, 0) \cup (0, \infty)$

Sec. 13.1

5) $\langle 3, -5, 7 \rangle + t\langle 3, 0, 1 \rangle$

$= \langle 3 + 3t, -5, 7 + t \rangle$

17) $9\langle \cos(t), \sin(t), 0 \rangle$

radius $= 9$

center $= (0, 0, 0)$

Plane: $z = 0$

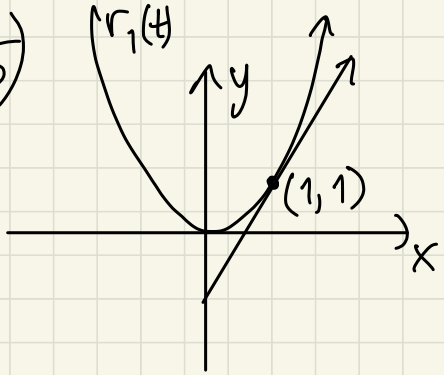
Sec. 13.2

3) $\lim_{t \to 0} e^{2t} i + \ln(t+1) j + 4k = i + 4k$

5) This is the same as the derivative of $r(t)$. $r'(t) = \langle -t^{-2}, \cos(t), 0 \rangle$

7) $r'(t) = \langle 1, 2t, 3t^2 \rangle$

15)

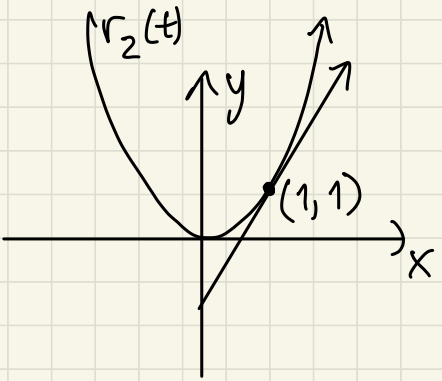


$r_1(1) = \langle 1, 1 \rangle$

$r_1'(t) = \langle 1, 2t \rangle$

$r_1'(1) = \langle 1, 2 \rangle$

tangent line $= \langle 1, 1 \rangle + t\langle 1, 2 \rangle = \langle t+1, 2t+1 \rangle$



$r_2(1) = \langle 1, 1 \rangle$

$r_2'(t) = \langle 3t^2, 6t^5 \rangle$

$r_2'(1) = \langle 3, 6 \rangle$

tangent line $= \langle 1, 1 \rangle + t\langle 3, 6 \rangle = \langle 3t+1, 6t+1 \rangle$

31) $r(2) = \langle -3, 10, 16 \rangle$

$r'(t) = \langle -2t, 5, 6t^2 \rangle$ $r'(2) = \langle -4, 5, 24 \rangle$

tangent line $= \langle -3, 10, 16 \rangle + t\langle -4, 5, 24 \rangle$

$= \langle -4t-3, 5t+10, 24t+16 \rangle$

33) $r(2) = 2i - \frac{1}{3}k$

$r'(s) = -4s^{-2}i + 8s^{-4}k$

$r'(2) = -1i + \frac{1}{2}k$

tangent line $= \left(2i - \frac{1}{3}k\right) + s\left(-1i + \frac{1}{2}k\right)$

$= (-s+2)i + \left(\frac{s}{2} - \frac{1}{3}\right)k$

41) $\left(\frac{u^4}{4}i + \frac{u^6}{6}j\right)\Big|_{-2}^{2} = \left(\frac{2^4}{4} - \frac{(-2)^4}{4}\right)i + \left(\frac{2^6}{6} + \frac{(-2)^6}{6}\right)j$

$= (2-2)i + (6-6)j = 0$

49) $r(t) = \int (t^2 i + 5tj + k)\,dt$

$= \frac{t^3}{3}i + \frac{5}{2}t^2 j + tk + C$ ← (general solution)

$r(1) = \frac{1}{3}i + \frac{5}{2}j + k + C = j + 2k$

$C = -\frac{1}{3}i - \frac{3}{2}j + k$

$r(t) = \left(\frac{t^3-1}{3}\right)i + \left(\frac{5t^2-3}{2}\right)j + (t+1)k$