Afsana Rahman
Dr Z - Calc 3
HW2: 12.3-5, 13.1-2
Homework due 9/20

$\boxed{12.3}$ 1) $\langle 1,2,1\rangle \cdot \langle 4,3,5\rangle$

$1\cdot4 + 2\cdot3 + 5\cdot1 = 4+6+5 = 15$

13) $\langle 1,1,1\rangle \cdot \langle 1,-2,-2\rangle$

$1\cdot1 + 1\cdot-2 + 1\cdot-2 = 1-2-2 = -3 \neq 0$

NOT ORTHOGONAL

$2|A||B|\cos\theta = |A|^2 + |B|^2 - |A-B|^2$

$2\sqrt{3}\sqrt{9}\cos\theta = 3+9-(0^2+3^2+3^2)$

$6\sqrt{3}\cos\theta = 12-18$

$\cos\theta = -\frac{\sqrt{3}}{3}$ OBTUSE θ

21) $2|A||B|\cos\theta = |A|^2 + |B|^2 - |A-B|^2$

$2\sqrt{2}\sqrt{5}\cos\theta = 2+5-(1+0+2^2)$

$2\sqrt{10}\cos\theta = 7-5$

$\cos\theta = \frac{\sqrt{10}}{10}$

29) a) $\langle b,3,2\rangle \cdot \langle 1,b,1\rangle = \emptyset$

$b + 3b + 2 = 4b+2 = \emptyset$

$b = -\frac{1}{2}$

b) $\langle 4,-2,7\rangle \cdot \langle b^2,b,\emptyset\rangle = 0$

$4b^2 - 2b = 0 \Rightarrow 4b = 2$

$b = 0, \frac{1}{2}$

31) $\langle 2,0,-3\rangle \cdot \langle x,y,z\rangle = 0$

$2x - 3z = 0 \Rightarrow 2x = 3z$

ONE VECTOR: $\langle 3,0,2\rangle$

ANOTHER: $\langle 0,1,0\rangle$

(all values would correl)

57) $u = \langle 5,7,-4\rangle$, $v = \langle 0,0,1\rangle$

$|V| = \frac{A\cdot B}{|B|^2}B = \frac{0+0-4}{1}\langle 0,0,1\rangle$

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

63)

$\overline{OP} = \frac{u\cdot v}{|v|} = \frac{24+10}{\sqrt{68}} = \frac{34}{2\sqrt{17}} = \frac{17}{\sqrt{17}} = \sqrt{17}$

$\boxed{12.4}$ 1) $1\cdot3 - 2\cdot4 = -5$

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

15) $\langle 1,1,0\rangle \times \langle 0,0,1\rangle$

$a_2b_3 - b_2a_3,\ b_1a_3 - a_1b_3,\ a_1b_2 - b_1a_2$

$\langle 1-0, 0-1, 0-0\rangle = \langle 1,-1,0\rangle = i - j$

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

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

$= u\times u - 2v\times u + u\times 2v + 2v\times -2v$

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

$= 4\langle 1,1,0\rangle = \langle 4,4,0\rangle$

25) $-u$ (right hand rule)

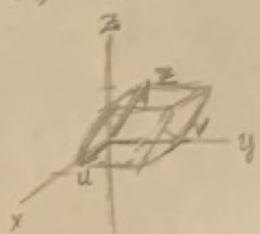
27) $\langle 3,0,0\rangle \times \langle 0,1,-1\rangle$

$\langle 0-0, 0+3, 3-0\rangle$

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

? how to solve geometrically?

39)



area of base $= x * y = 1 * 2 = 2$

volume of solid $=$ base $* z = 2 * 2 = 4$

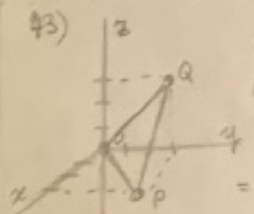
41) area of parallelogram $= u \times v$

$|\langle a_2b_3 - b_2a_3, b_1a_3 - a_1b_3, a_1b_2 - b_1a_2\rangle|$

$= |\langle 0-3, 6-1, 1-0\rangle| = |\langle -3,5,1\rangle|$

$= \sqrt{3^2+5^2+1^2} = \sqrt{9+25+1} = \sqrt{35}$

43)



$\overline{OP} = \langle 3,3,0\rangle$

$\overline{OQ} = \langle 0,3,3\rangle$

$\frac{1}{2}A\times B = \frac{1}{2}\langle 3,3,0\rangle \times \langle 0,3,3\rangle$

$= \frac{1}{2}\langle a_2b_3 - b_2a_3, b_1a_3 - a_1b_3, a_1b_2 - b_1a_2\rangle$

$= \frac{1}{2}\langle 9-0, 0-9, 9-0\rangle = \frac{1}{2}|\langle 9,-9,9\rangle|$

$= \frac{1}{2}\sqrt{9^2+9^2+9^2} = \frac{1}{2}\sqrt{243} = \frac{1}{2}9\sqrt{3} = \frac{9}{2}\sqrt{3}$

45) $\overrightarrow{AB} = \langle 3-1, 4-2\rangle = \langle 2,2\rangle$

$\overrightarrow{BC} = \langle -2-1, 2-2\rangle = \langle -3,0\rangle$

$\frac{1}{2}A\times B = \frac{1}{2}\langle 2,2\rangle \times \langle -3,0\rangle$

$= \frac{1}{2}\begin{vmatrix} a & b \\ c & d \end{vmatrix} = \frac{1}{2}\begin{vmatrix} 2 & \\ -3 & \end{vmatrix}$

$= \frac{1}{2}(ad - bc) = \frac{1}{2}(0+6$

Made with Scanner for Me

Afsana Rahman
Dr Z - Calc 3
HW2: 12.3-5, 13.1-2
Homework due 9/20

$\boxed{12.5}$

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

5) $1(x-3)+0+0=0$
$x=3$

9) $Ax+By+Cz=0$

11) b and d
(any vector that is some scalar $\times$ i)

13) $\langle 9,-4,-11\rangle$
(just use the scalars)

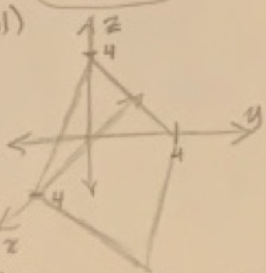
15) $\langle 3,-8,11\rangle$

17) $u=\overrightarrow{PQ}=\langle 1-2,1+1,1-4\rangle$
$=\langle -1,2,-3\rangle$
$v=\overrightarrow{PR}=\langle 3-2,1+1,-2-4\rangle$
$=\langle 1,2,-6\rangle$
$u\times v=\langle -12+6,-3-6,-2-2\rangle$
$=\langle -6,-9,-4\rangle$
$-6(x-2)-9(y+1)-4(z-4)=0$
$-6x+12-9y-9-4z+16=0$
$-6x-9y-4z=-19$
$6x+9y+4z=19$

19) $u=\overrightarrow{PQ}=\langle -1,1,1\rangle$
$v=\overrightarrow{PR}=\langle 1,0,1\rangle$
$u\times v=\langle 1-0,1+1,0-1\rangle$
$=\langle 1,2,-1\rangle$
$1(x-1)+2y-z=0$
$x+2y-z=1$

25) $i+k=\langle 1,0,1\rangle$
$1(x+2)+0+1(z-5)=0$
$x+z=3$

31)



53) $3sx+by+2sz=5s$
where s is some scalar $\neq 0$

$\boxed{13.1}$

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

17) in the x-y plane (no z given)
$r(t)=\langle 9\cos t, 9\sin t\rangle$
centered @ origin (no coordinates added to the t-functions)
radius $=9$ (the scalar it's multiplied by)

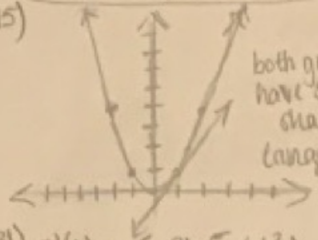
$\boxed{13.2}$

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

5) $\frac{d}{dt}r(t)=\frac{d}{dt}\langle t^{-1},\sin t,4\rangle$
$=\langle -t^{-2},\cos t,0\rangle$

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

15)



both graphs have same shape/ tangent

31) $r'(t)=\langle -2t,5,6t^2\rangle$
$r'(2)=\langle -2(2),5,6(4)\rangle$
$=\langle -4,5,24\rangle$
$\langle x,y,z\rangle=(-3,10,16)+t(r'(2))$
$=(-3,10,16)+\langle -4t,5t,24t\rangle$
$=\langle -3-4t,10+5t,16+24t\rangle$

33) $r(s)=\langle \frac{4}{s},0,\frac{8}{3s^3}\rangle$
$r'(s)=\langle -\frac{4}{s^2},0,-\frac{8}{s^4}\rangle$
$r'(2)=\langle -\frac{4}{4},0,-\frac{8}{16}\rangle$
$=\langle -1,0,-\frac{1}{2}\rangle$
$\langle x,y,z\rangle=(2,0,\frac{1}{3})+t(r'(2))$
$=(2,0,\frac{1}{3})+\langle -t,0,-\frac{1}{2}t\rangle$
$=\langle 2-t,0,\frac{1}{3}-\frac{1}{2}t\rangle$

41) $\int_{-2}^{2}\langle u^3,u^5,0\rangle du=\langle \frac{1}{4}u^4,\frac{1}{6}u^6,0\rangle+C\Big|_{-2}^{2}$
$\langle \frac{1}{4}(2^4),\frac{1}{6}(2^6),0\rangle-\langle \frac{1}{4}(-2^4),\frac{1}{6}(-2^6),0\rangle=0$

49) $r'(t)=\langle t^2,5t,1\rangle$
$r(t)=\int r'(t)\,dt=\langle$ …
$r(1)=\langle 0,1,2\rangle-\langle \frac{1}{3}t^3$ …
$C=\langle -\frac{1}{3}t^3,1-\frac{5}{2}t^2,2$ …
$r(t)=\langle \frac{1}{3}(t-1),\frac{1}{2}(5t^2-3),t+1\rangle$

Made with Scanner for Me