12.3 HW

1. Scalar

13. $\langle 1,1,1\rangle, \langle 1,-2,-2\rangle$ $\cos\theta = (a\cdot b)//(|a|\cdot|b|)$

$\cos\theta = (-3) / (\sqrt{3}\cdot 3) = \cos\theta \cdot (-1/\sqrt{3}) =$ obtuse

21. $\langle i+j\rangle, \langle j+2k\rangle = \langle 1,1,0\rangle, \langle 0,1,2\rangle$ $|a| = \sqrt{2}$ $|b| = \sqrt{3}$

$a\cdot b : 0+1+0 = 1$ $\boxed{\cos\theta = \frac{1}{\sqrt{10}}}$

29. $\overset{Y}{\langle b,3,2\rangle}, \overset{Y}{\langle 1,b,1\rangle}$ $\cos(0) = 1$ $|x| = \sqrt{b^2+13}$ $|y| = \sqrt{b^2+2}$

a) $b = \frac{1}{2}$

$b + 3b + 2$ $(4b+2)$ $|x|\cdot|y| = 1$

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

$\overset{x}{\langle 4,-2,7\rangle}, \overset{Y}{\langle b^2,b,0\rangle}$ $|x| = \sqrt{69}$ $|y| = \sqrt{b^4+b^2} = b^3$

$x\cdot y = 4b^2 - 2b + 0$ $4b^2 - 2b \cdot (\sqrt{69}\cdot b^3) = 1$

$u = \langle 5,7,-4\rangle$

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

57. $\frac{\vec{u}\cdot\vec{v}}{|\vec{v}|^2}, \vec{v} = \frac{-4}{1}, \langle 0,0,1\rangle = \boxed{-4k}$

68

2 34

2 17

63. $\overrightarrow{OP} = P - O = \boxed{\sqrt{17}}$ $\frac{u\cdot v}{|v|} = \frac{34}{\sqrt{68}} = \frac{34\sqrt{68}}{68} = \frac{\sqrt{68}}{2} = \frac{2\sqrt{17}}{2} = \sqrt{17}$

12.4 HW

1. $\begin{vmatrix} 1 & 2 \\ 4 & 3 \end{vmatrix} = 3-8 = -5$

5. $\begin{vmatrix} 1 & 2 & 1 \\ 4 & -3 & 0 \\ 1 & 0 & 1 \end{vmatrix} = 1\begin{vmatrix} -3 & 0 \\ 0 & 1 \end{vmatrix} - 2\begin{vmatrix} 4 & 0 \\ 1 & 1 \end{vmatrix} + 1\begin{vmatrix} 4 & -3 \\ 1 & 0 \end{vmatrix}$

$= (-3) - 2(4) + (+3) = -3-8+3 = \boxed{-8}$

13. $(i+j) \times k$ $\quad \begin{vmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix} = (1)i - (1)j = \boxed{i-j}$

21. $(u-2v) \times (u+2v) = \langle 4,4,0 \rangle$ $\quad u \times w = v \quad v \times w = u$

$v = \langle 0,3,1 \rangle \quad u = \langle 2,-1,1 \rangle$

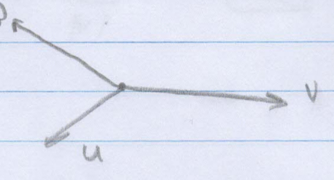
25. $-u$

27. $v = \langle 3,0,0 \rangle \quad w = \langle 0,1,-1 \rangle \qquad u = \langle 0,b,c \rangle$

u is orthogonal to w $\quad u \cdot w = b+c = 0$, $u = \langle 0,b,-b \rangle$

$u = \langle 0,3,-3 \rangle$ $\qquad |u| = \sqrt{b^2+(-b)^2} = |b|\sqrt{2} = |v| \cdot |w| \sin\frac{\pi}{2} = 2\sqrt{}$

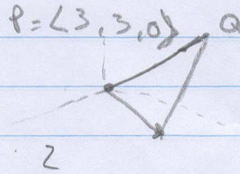
39. $u = \langle 1,0,0 \rangle \quad v = \langle 0,2,0 \rangle \quad w = \langle 1,1,2 \rangle$ $\qquad$ Volume $= 4$



41. $A = |v \times u| \quad u = \langle 1,0,3 \rangle \quad v = \langle 2,1,1 \rangle$

$|\langle -3,5,1 \rangle| = \sqrt{9+25+1} = \boxed{\sqrt{35}}$

43. $A = \frac{|P \times Q|}{2} \quad P = \langle 3,3,0 \rangle \quad Q = \langle 0,3,3 \rangle \quad P \times Q = \langle 9,-9,9 \rangle \quad |P \times Q| = \sqrt{243}/2 = \boxed{7.79}$



x y z

45. $(1,2), (3,4), (-2,2)$ $\qquad x \times y = \begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix} \quad 4-6 = \frac{-2^2}{2}$

$\boxed{A=3}$

12.5 HW

1. $n = \langle 1,3,2 \rangle$, $\langle 4,-1,1 \rangle$

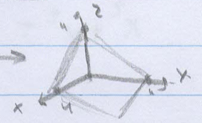
$a(x-x_0)+b(y-y_0)+c(z-z_0)=0$ $1(x-4)+3(y+1)+2(z-1) = x-4+3y+3+2z-2$
$= \boxed{x+3y+2z=3}$

5. $n = i$ $(1,0,0)$, $(3,1,-9)$

$1(x-3)+0(y-1)+0(z+9)=0$: $x-3=0$ $\boxed{x=3}$

9. $x=0$

31) $x+y+z=4$ $\longrightarrow$



11. b and d

53) $(3\lambda)x + by + (2\lambda)z = 5\lambda$

13. $9x-4y-11z=2$: $(9,-4,-11)$

15. $3(x-4)-8(y-1)+11z=0$ $n = (3,-8,11)$

17. $P=(2,-1,4)$, $Q=(1,1,1)$, $R=(3,1,-2)$

$n = \overrightarrow{PQ} = Q-P = (-1,2,-3)$ $V = \overrightarrow{PR} = R-P = (1,2,-6)$
$u \times V = (-6,-9,-4) = n$

$-6(x+1)-9(y+2)-4(z+3) = -6x-6-9y+18-4z-12=0$
$6x+9y+4z=19$

19. $P=(1,0,0)$ $Q=(0,1,1)$ $R=(2,0,1)$

$u = Q-P = (1,1,1)$ $V = R-P = (1,0,1)$ $u \times V = (1,0,-1)$

Eq $= x+2y-z=11$

25. $n = (1,0,1)$ $P = (-2,-3,5)$ Eq: $1(x+2)+0(y+3)+1(z-5) = x+2+z-5=0$
$\boxed{x+z=3}$

13.1 Hw

5. $P = (3, -5, 7)$ $\quad v = (3, 0, 1)$

$$\vec{r} = \vec{r}_0 + t\vec{v} = (3, -5, 7) + t(3, 0, 1) =$$

$$= (3, -5, 7) + (3t, 0, t) = (3+3t, -5, 7+t)$$

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

17. $r(t) = \overset{x}{(9\cos t)}i + \overset{y}{(9\sin t)}j$

$x^2 + y^2 = 81\cos^2 t + 81\sin^2 t = 81$ $\quad$ radius $= 9$

center at origin in xy plane

13.2 HW

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

$= (1) i + (0) j + 4k = \boxed{i + 4k}$

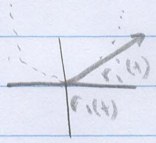
5. $\lim_{h \to 0} \frac{r(t+h) - r(t)}{h}$ for $r(t) = \langle t^{-1}, \sin t, 4 \rangle$

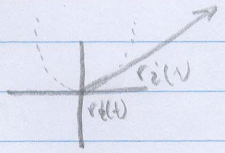
$= \langle -\frac{1}{t^2}, \cos t, 0 \rangle$ (derivative)

7. $r(t) = \langle t, t^2, t^3 \rangle$

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

15.





31. $r(t) = \langle 1 - t^2, 5t, 2t^3 \rangle, t = 2$ $\quad L(t) = r(t) + t r'(t)$

$r'(t) = \langle -2t, 5, 6t^2 \rangle$ $\quad t = 2 :$ $\boxed{\langle -3, 10, 16 \rangle + t \langle -4, 5, 24 \rangle}$

33. $r(s) = 4s^{-1} i - 8/3\, s^{-3} k, s = 2$ (same eq as last time) ↑

$\boxed{L(t) = (2 - s) i + (1/2\, s - 1/3) k}$

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

49. $r'(t) = t^2 i + 5t j + k$ $\quad r(1) = j + 2k$

$r(t) = \cancel{2t}\, i + 5 j$ $\quad \boxed{r(t) = \langle t^3/3 - 1/3, 5t^2/2 - 3/2, t + 1 \rangle}$