12.3 HW Orion Kress Sanfilippo

1) $(1\cdot4)+(2\cdot3)+(1\cdot5)=\boxed{15}$

13) $P(1, 1, 1)$, $Q(1, -2, -2)$ $[P\cdot Q]=1$ Not Orthogona[l]

Positive ∴ Acute

$$\frac{P\cdot Q}{|P||Q|}=\frac{1}{(\sqrt{3})(3)}=\frac{\sqrt{3}}{9}$$

21) $1i+1j$, $j+2k$ $\cos\theta=\boxed{\frac{1}{\sqrt{10}}}$

29) $b+3b+2=0$ $b=(-0.5)$

31) $P(-3, 0, 2)$ $Q(3, 1, 2)$

$2(-3)+0+-3\cdot(-2)=0$ ✓ $2(3)+0+(-3)(2)=0$ ✓

57) $u=5i+7j-4k$; $v=\hat{k}$

Projection $=-4k$

63) $\|\overrightarrow{OP}\|=|u|\cos\theta=\sqrt{34}\cdot\frac{24\hat{i}+10\hat{j}}{34\sqrt{2}}=\boxed{\frac{24\hat{i}+10\hat{j}}{2\sqrt{17}}}$

$u=3\hat{i}+5\hat{j}$ $v=8\hat{i}+2\hat{j}$

$$\cos(\theta)=\frac{\vec{u}\cdot\vec{v}}{|\vec{u}||\vec{v}|}=\frac{24\hat{i}+10\hat{j}}{\sqrt{34}\sqrt{68}}=\frac{24\hat{i}+10\hat{j}}{\sqrt{2\cdot17}\sqrt{4\cdot17}}=\frac{24\hat{i}+10\hat{j}}{34\sqrt{2}}$$

17 2

1	5	13	21	25
27	39	41	43	45

12.4 HW

1) $\begin{vmatrix} 1 & 2 \\ 4 & 3 \end{vmatrix} = A$; $\boxed{\det(A) = -5}$

5) $\begin{vmatrix} 1 & 2 & 1 \\ 4 & -3 & 0 \\ 1 & 0 & 1 \end{vmatrix} = A$ $\det(A) = 1(-3) - 2(4) + 1(-3) = \boxed{-14}$

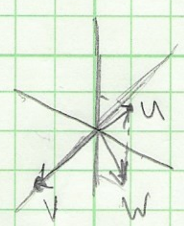
13) $\det\begin{bmatrix} i & j & k \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \boxed{\hat{i} - \hat{j}}$

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

$\boxed{0}$

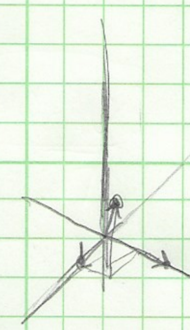
25) $\boxed{v \times w = -u}$

27) $v = (3, 0, 0)$ $w = (0, 1, -1)$



$\boxed{v \times w = (0, 1, 1)}$

39) $\vec{u} = (1, 0, 0)$ $\vec{v} = (0, 2, 0)$ $\vec{w} = (1, 1, 2)$



$(\vec{u} \times \vec{v}) \cdot \vec{w} = \text{Volume}$

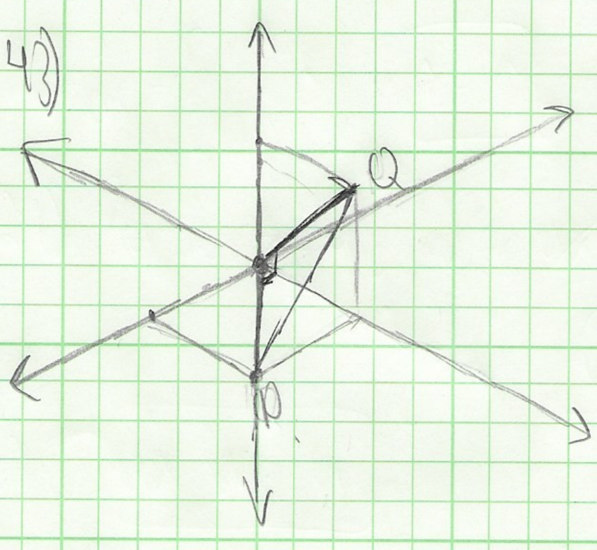
$(\boxed{\vec{u} \times \vec{v} = 2\hat{k}}) \cdot \vec{w} = 0 + 0 + \boxed{4\ u^3}$

Orion Kress Sanfilippo

41) $A = (\vec{u} \times \vec{v}) = \left| \det \begin{vmatrix} \hat{i} & \hat{j} & k \\ 1 & 0 & 3 \\ 2 & 1 & 1 \end{vmatrix} \right| = \left| 3\hat{i} - 7\hat{j} + 1\hat{k} \right|$

$= \sqrt{9 + 49 + 1} = \boxed{\sqrt{59}\, u^2}$

43)



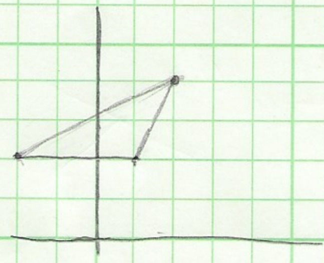
$A_T = \dfrac{|\vec{P} \times \vec{Q}|}{2} =$

$= \left| \det \begin{vmatrix} i & j & k \\ 3 & 0 & 0 \\ 0 & 3 & 3 \end{vmatrix} \right| = \sqrt{9^2 + 9^2 + 9^2} =$

$= 3\sqrt{27} = 9\sqrt{3}$

$\boxed{A_T = \dfrac{9\sqrt{3}}{2}}$

45)



$P(-2, 0)\ Q(1, 2)$

$A_T = \dfrac{|P \times Q|}{2} = \dfrac{\sqrt{(-4)^2 + 0}}{2} = \boxed{2}$

1 5 9 11 13
15 17 19 25 31
53

12.5 HW

1) $4x + 3y + 2z = 4 \cdot 1 - 3 \cdot 1 + 2 \cdot 1 = 3$ $d = 3$, $\boxed{4x + 3y + 2z = 3}$

5) $\boxed{x = 3}$ 9) $\boxed{z = 0}$

11) (b) $n = \langle 1, 0, 0 \rangle$ is a normal vector

(c) The eqn has form $ay + bz = d$

13) $\boxed{\vec{v}_N = \langle -9, 4, 11 \rangle}$

15) $\boxed{\vec{v}_N = \langle 3, -8, 11 \rangle}$

17) $\vec{PQ} = \langle -1, 2, -3 \rangle$ $\vec{PR} = \langle 1, 2, -6 \rangle$

$$\vec{PQ} \times \vec{PR} = \det \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -1 & 2 & -3 \\ 1 & 2 & -6 \end{vmatrix} = (-12 - 6)\hat{i} - (6 - 3)\hat{j} + (0)\hat{k}$$

$$= \boxed{-18\hat{i} - 3\hat{j}}$$

$\vec{n} = (-18, -3, 0) = 3(6, 1, 0)$

$\boxed{-18(x-1) - 3(y-1) = 0}$

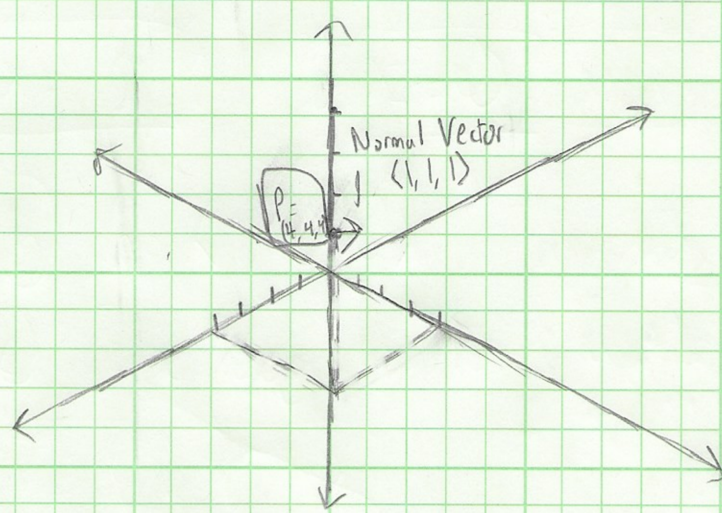
19) $\vec{PQ} = \langle -1, 1, 1 \rangle$ $\vec{PR} = \langle 1, 0, 1 \rangle$

$\vec{PQ} \times \vec{PR} = \hat{i} - (0)\hat{j} + (1)\hat{k} = \hat{i} - k$

$\boxed{1(x-2) - (z-1) = 0}$

25) $\boxed{(x+2)+(y+3)=0}$

31)



53) $\vec{n} = y$

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

$P = (1, 0, 1)$

$\vec{n} = (3, 0, 2)$

$\boxed{3(x-1)+a(y)+2(z-1)=0}$

$\boxed{a \in \mathbb{R}}$

13.1 HW

Orion Kress Santilippo

5) $P + t(\vec{v}) = 0 \Rightarrow (3, -5, 7) + \langle 3t, 0, t \rangle = 0$

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

17) $r(t) = (9\cos(t))\hat{i} + (9\sin(t))\hat{j}$

Center: $P(0,0,0)$
Radius: 9
Plane: $z = 0$

3 5 7 15 31 33 41 49

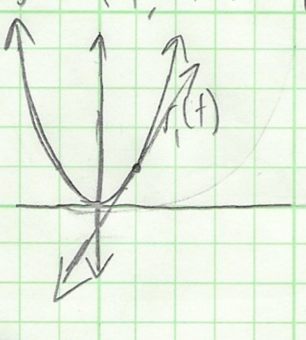
13.2 HW

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

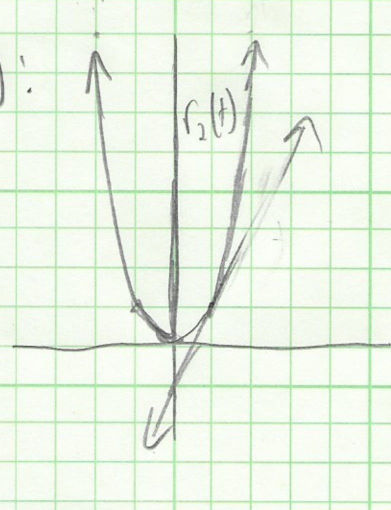
5) $\lim_{h \to 0} \frac{r(t+h) - r(t)}{h}$ $r(t) = \langle t^{-1}, \sin(t), 4 \rangle$ $r'(t) = \langle -t^{-2}, \cos(t), 0 \rangle$

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

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



$r_2(t)$:



Orion Kress Sanfilippo

31) $r(t) = \langle 1-t^2, 5t, 2t^3 \rangle$ $t=2$

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

$r(2) = \langle -1, 10, 16 \rangle$

$$\boxed{r_t(t) = \langle -4t-1, 5t+10, 24t+16 \rangle}$$

33) $r(s) = \langle 4s^{-1}, 0, -\frac{8}{3}s^{-3} \rangle$ $s=2$

$r'(s) = \langle -4s^{-2}, 0, +8s^{-4} \rangle$ $r'(2) = \langle -1, 0, \frac{1}{2} \rangle$

$r(2) = \langle 2, 0, -\frac{1}{3} \rangle$

$$\boxed{r_t(t) = \langle 2-t, 0, \frac{t}{2} - \frac{1}{3} \rangle}$$

41) $\int_{-2}^{2} \langle u^3, u^5 \rangle du$

$$\left\langle \frac{u^4}{4}\Big|_{-2}^{2}, \frac{u^6}{6}\Big|_{-2}^{2} \right\rangle = \boxed{\left(8, \frac{64}{3}\right)}$$

49) $r'(t) = t^2\hat{i} + 5t\hat{j} + 1k$ $r(1) = \hat{j} + 2k$

$$\boxed{r(t) = \int r'(t)\,dt = \frac{t^3}{3}\hat{i} + 5\frac{t^2}{2}\hat{j} + tk + C}$$ Gen. Sol'n

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

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

$$\boxed{r(t) = \left(\frac{t^3-1}{3}\right)\hat{i} + \left(\frac{5t^2-3}{2}\right)\hat{j} + (t+1)\hat{k}}$$ Specific Sol'n