Q1(1):

$$\begin{cases} \frac{a+b}{4} = \frac{b+c}{5} \\ \\ \frac{b+c}{5} = \frac{c+a}{6} \end{cases} \iff \begin{cases} 5a+b=4c......(1) \\ \\ 5a-6b=c......(2) \end{cases}$$

By (1)-(2), we have $b = \frac{3}{7}c$.

Substitue it into (1), we have $a = \frac{5}{7}c$.

Therefore, $a : b : c = 5 : 3 : 7 = 1 : \boxed{\dfrac{3}{5}} : \boxed{\dfrac{7}{5}}$.

Q1(2):

We have $a + b = 6$ and $ab = 3^2 - (2\sqrt{2})^2 = 1$.

Therefore, $a^2 + b^2 = (a + b)^2 - 2ab = 6^2 - 2(1) = \boxed{34}$.

Moreover, $\frac{a^2}{b} + \frac{b^2}{a} = \frac{(a+b)^3 - 3ab(a+b)}{ab} = \frac{6^3 - 3(1)(6)}{1} = \boxed{198}$.

Alternative Calculating directly, we have:

$a^2 + b^2 = (3 + 2\sqrt{2})^2 + (3 - 2\sqrt{2})^2 = (17 + 12\sqrt{2}) + (17 - 12\sqrt{2}) = \boxed{34}$.

$\frac{a^2}{b} + \frac{b^2}{a} = \frac{17+12\sqrt{2}}{3-2\sqrt{2}} + \frac{17-12\sqrt{2}}{3+2\sqrt{2}} = \frac{(99+70\sqrt{2})+(99-70\sqrt{2})}{3^2-(2\sqrt{2})^2} = \boxed{198}$.

Q1(3):

$\cos 30^\circ \sin 45^\circ \tan 60^\circ + \cos 135^\circ \sin 120^\circ \tan 150^\circ$

$= (\frac{\sqrt{3}}{2})(\frac{\sqrt{2}}{2})(\sqrt{3}) + (-\frac{\sqrt{2}}{2})(\frac{\sqrt{3}}{2})(-\frac{\sqrt{3}}{3})$

$= \frac{3\sqrt{2}}{4} + \frac{\sqrt{2}}{4}$

$= \boxed{\sqrt{2}}$

Q1(4):

$$(x+1)^2 + 9(x+1) + 20 = 0$$

$$(x+1+5)(x+1+4) = 0$$

$$x = \boxed{-5}, \boxed{-6}$$

Q1(5):

$$-ax^2 + bx + 4 \geq 0$$

$$ax^2 - bx - 4 \leq 0$$

$$\alpha \leq x \leq \beta$$

Where $\alpha \leq \beta$ are the two solutions of $-ax^2 + bx + 4 = 0$.

As $-\frac{1}{3} \leq x \leq 4$, we have:

$$\begin{cases} -a(\frac{1}{9}) - b(\frac{1}{3}) + 4 = 0 \\ \\ -16a + 4b + 4 = 0 \end{cases} \iff \begin{cases} a + 3b = 36......(1) \\ \\ 4a - b = 1......(2) \end{cases}$$

By $(1) + 3 \times (2)$, we have $13a = 19$, i.e. $a = \boxed{3}$.

Substitue it into (2), we have $b = 12 - 1 = \boxed{11}$.

Q1(6):

$\log_a b^a \times \log_b a^b$

$= a \log_a b \times b \log_b a$

$= a \frac{\log b}{\log a} \times b \frac{\log a}{\log b}$

$= ab.$

When $a = 3, b = 2$, the expression=$\boxed{6}$.

Q1(7):

As $f(1) = 3$, we have $-1 - 2a + b = 3$, i.e. $2a - b = -4$......(1).

By completing the square, we have $f(x) = -(x+a)^2 + a^2 + b$. As the maximum value is 4, we have $a^2 + b = 4$......(2).

By (1)+(2), we have $a^2 + 2a = 0$, i.e. $a = \boxed{-2}$ as $a \neq 0$.

Substitue it into (1), we have $b = 2(-2) + 4 = \boxed{0}$.

Q1(8):

Note that $\{a_n\}$ is an arithmetic sequence with a common difference 3. Therefore, we have the general formula $a_n = 2 + 3(n-1)$.

Solving $a_n > 100$ for $n \in \mathbb{N}$, we have $3n > 101$, i.e. $n > \frac{101}{3} > 33$.

Therefore, the minimum value of n satisfies it is $\boxed{34}$.

Q1(9):

(i): $f(2) = 2^3 - 2 \cdot 2 + 4 = \boxed{8}$.

(ii): As $f'(x) = 3x^2 - 2$, we have $f'(2) = 3(2)^2 - 2 = \boxed{10}$.

(iii): By testing among potential possible rational roots $\pm 1, \pm 2, \pm 4$ given by the rational root theorem, we have $x = -2$ is a rational root.

By the lond division, we have $x^3 - 2x + 4 = (x+2)(x^2 - 2x + 2)$.

Therefore, $f(x) = 0 \iff x = -2$ or $x^2 - 2x + 2 = 0$.

For the latter, as $\Delta = 4 - 4(1)(2) = -4 < 0$, the equation has no real roots.

Given the above, the only real value of x satisfying $f(x) = 0$ is $x = \boxed{-2}$.

(iv): $\int_0^2 f(x)dx = \int_0^2 (x^3 - 2x + 4)dx = \frac{1}{4}x^4 - x^2 + 4x|_0^2 = \boxed{8}$.

Q2:

(1): The coordinates of the centre of $\triangle ABC$ is given by

$(\frac{a-1+2}{3}, \frac{b+0+1}{3}) = (\frac{a+1}{3}, \frac{b+1}{3})$.

If D is the centre, we have $\frac{a+1}{3} = 0$, i.e. $a = \boxed{-1}$ and $\frac{b+1}{3} = 2$, i.e. $b = \boxed{5}$.

(2): If ABCD is a parallelogram, then $AB//CD$ and $AD//BC$, i.e. the slope of AB is equal to that of CD and that of AD is equal to that of BC.

Therefore, we have $\frac{b-0}{a+1} = \frac{1-2}{2-0}$ and $\frac{b-2}{a-0} = \frac{0-1}{-1-2}$.

i.e. $a+2b=-1......(1)$ and $a-3b=-6......(2)$.

By $(1)-(2)$, we have $5b=5$, i.e. $b=\boxed{1}$.

Substitue it into (1), we have $a=-1-2=\boxed{-3}$.

Alternative If ABCD is a parallelogram, then we have $\vec{BA}=\vec{CD}$, i.e.

$<0-2,2-1>=<-2,1>$.

Therefore, $(a,b)=(-1-2,0+1)=(\boxed{-3},\boxed{1})$.

(3): If $\angle ABC=90°$, we have the slope of AB multipled by the slope of BC is equal to -1, i.e. $(\frac{b-0}{a+1})(\frac{0-1}{-1-2})=-1$, i.e. $3a+b=-3......(1)$.

On the other hand, as D is lying on AC, we have the slope of AC is equal to the slope of DC, i.e. $\frac{b-1}{a-2}=\frac{1-2}{2-0}$, i.e. $a+2b=4......(2)$.

By $(2)-2\times(1)$, we have $-5a=10$, i.e. $a=\boxed{-2}$.

Substitue it into (1), we have $b=-3-3(-2)=\boxed{3}$.

(4): $\vec{CA}=<a-2,b-1>$, $\vec{CB}=<-3,-1>$ and $\vec{CD}=<-2,1>$.

If $\vec{CA}=2\vec{CB}-3\vec{CD}$, then $<a-2,b-1>=2<-3,-1>-3<-2,1>=<0,-5>$.

By solving, we have $a=\boxed{2}$ and $b=\boxed{-4}$.

(5): $\vec{BA}=<a+1,b>$, $\vec{BC}=<3,1>$ and $\vec{BD}=<1,2>$.

By $\vec{BA}\cdot\vec{BC}=-2$, we have $3(a+1)+b=-2$, i.e. $3a+b=-5......(1)$.

By $\vec{BA}\cdot\vec{BD}=1$, we have $a+1+2b=1$, i.e. $a+2b=0......(2)$.

By $(2) - 2 \times (1)$, we have $-5a = 10$, i.e. $a = \boxed{-2}$.

Substitue it into (1), we have $b = -5 - 3(-2) = \boxed{1}$.

Q3:

(1): As the region is on the left of the vertical line $x = 1$, we have $\boxed{x < 1}$.

Moreover, as the region is above the inclined line $y = x+1$, we have $\boxed{y > x + 1}$.

(2): As the region is below the inclined line $y = x + 1$, we have $\boxed{y < x + 1}$.

As the region is above the parabola $y = x^2$, we have $\boxed{y > x^2}$.

(3): As the region is outside the region bounded by $|x| = 1$, we have $\boxed{|x| > 1}$.

As the region is above the parabola $y = x^2$, we have $\boxed{y > x^2}$.

(4): As the region is below the parabola $y = x^2$, we have $\boxed{y < x^2}$.

As the region is inside the circle $x^2 + y^2 = 1$, we have $\boxed{x^2 + y^2 < 1}$.

(5): As the region is inside the region bounded by $|x| = 1$, we have $\boxed{|x| < 1}$.

As the region is outside the circle $x^2 + y^2 = 1$, we have $\boxed{x^2 + y^2 > 1}$.