Q1(1):

$$ax^2 - 3ax + 2a < 0$$

$$x^2 - 3x + 2 < 0$$

$$(x-2)(x-1) < 0$$

$$\boxed{1 < x < 2}$$

Q1(2):

$$4^{3x-1} - 2^{5x-4}$$

$$2^{6x-2} = 2^{5x-4}$$

$$6x - 2 = 5x - 4$$

$$x = \boxed{-2}$$

Q1(3):

$10^{\log_{10} 5} = \boxed{5}$

Q1(4):

Sum of roots=$\alpha + \beta = -\frac{-5}{1} = 5$ and product of roots=$\alpha\beta = \frac{3}{1} = 3$.

Then, $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = 5^2 - 2 \cdot 3 = \boxed{19}$.

$(\alpha - \beta)^2 = (\alpha + \beta)^2 - 4\alpha\beta = 5^2 - 4 \cdot 3 = \boxed{13}$.

Q1(5):

As $(\vec{a} - \vec{b})^2 = |\vec{a}|^2 - 2\vec{a} \cdot \vec{b} + |\vec{b}|^2 = 5 - 2\vec{a} \cdot \vec{b} = |\vec{a} - \vec{b}|^2 = 7$, we have $\vec{a} \cdot \vec{b} = -1$.

Therefore, $\cos\theta = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}||\vec{b}|} = -\frac{1}{2}$.

$\theta = \boxed{120^\circ}$

Q1(6):

$\sin(\angle B + \angle C) = \sin(180^\circ - \angle A) = \sin \angle A = \sin 30^\circ = \boxed{\frac{1}{2}}$.

Q1(7):

The multiples of 3 are: $102, 105, ..., 198$.

As $198 = 102 + 3 \cdot 32$, there are $\boxed{33}$ multiples of 3.

Moreover, the sum$=\frac{(102+198)(33)}{2} = \boxed{4950}$.

Q1(8):

By the factor theorem, $1 + a + b + 5 = 0$, i.e. $a + b = -6$......(1).

By the remainder theore, $8 + 4a + 2b + 5 = 5$, i.e. $2a + b = -4$......(2).

(2)-(1): $a = \boxed{2}$.

Substitue it into (1), we have $b = -6 - 2 = \boxed{-8}$.

Q1(9):

$f(0) = |-1| = \boxed{1}$.

Note that when $0 < x < 1$, $|x^2-1| = 1-x^2$ and when $1 < x < 2$, $|x^2-1| = x^2-1$.

Therefore, $\int_0^2 |x^2-1|dx$

$= \int_0^1 (1-x^2)dx + \int_1^2 (x^2-1)dx$

$= [x - \frac{1}{3}x^3]_0^1 + [\frac{1}{3}x^3 - x]_1^2$

$= 1 - \frac{1}{3} + \frac{8}{3} - 2 - \frac{1}{3} + 1$

$= \boxed{2}$.

Q1(10):

Let the arithmetic progression be $b + nd$.

As $a + b + c = 24$, we have $(b-d) + b + (b+d) = 24$, i.e. $b = \boxed{8}$.

As $abc = 440$, we have $(8-d)(8+d) = 55$, i.e. $d^2 = 9$, i.e. $d = 3$ (as the progression is increasing).

Therefore, $a = \boxed{5}$ and $c = \boxed{11}$.

Q2:

(1): By the two points form of straight line, we have AC is $y - 0 = \frac{0-3}{4-0}(x-4)$,

i.e. $\boxed{3}x + \boxed{4}y - \boxed{12} = 0$.

(2): The mid-point of AC is $(2, \frac{3}{2})$ and the slope of the line perpendicular to AC is $\frac{4}{3}$.

Therefore, the perpendicular bisector of AC is $y - \frac{3}{2} = \frac{4}{3}(x-2)$,

i.e. $8x - 6y = 7$......(1).

The perpendicular bisctor of AB is $y = 0$......(2).

As the circumcenter is the intersection of any two perpendicular bisectors, by solving (1),(2), we have the coordinates $(\frac{\boxed{7}}{8}, \boxed{0})$.

(3): By the angle bisector theorem, OD:DC=(The distance between B and the x-axis):BC=$\boxed{3:5}$.

Note that the incentre lies on the x-axis. Therefore, the x-coordinate of it is $\frac{3\cdot 4+5\cdot 0}{3+5} = \frac{3}{2}$ and the coordinates of it is $(\frac{\boxed{3}}{2}, \boxed{0})$

Q3:

(1): As the line is tangent to the parabolas, the equations:

$$x^2 - 5x + 7 = x + k,\ x^2 + 3x - 1 = x + k$$

have only one soltion, i.e.

$$\Delta_1 = 36 - 4(7-k) = 0 \text{ and } 4 - 4(-1-k) = 0$$

$$k = \boxed{-2}$$

(2): Solving the equations

$$x^2 - 5x + 7 = x - 2,\ x^2 + 3x - 1 = x - 2$$

$$x_P = \boxed{3} \text{ and } x_Q = \boxed{-1}$$

Moreover, find the intersection of the two parabolas

$$x^2 - 5x + 7 = x^2 + 3x - 1$$

$$x_R = \boxed{1}$$

(3): The area$=\int_{-1}^{1}((x^2 + 3x - 1) - (x - 2)dx + \int_{1}^{3}((x^2 - 5x + 7) - (x - 2))dx$

$= [\frac{1}{3}x^3 + x^2 + x]_{-1}^{1} + [\frac{1}{3}x^3 - 3x^2 + 9x]_{1}^{3}$

$= \frac{1}{3} + 1 + 1 + \frac{1}{3} - 1 + 1 + 9 - 27 + 27 - \frac{1}{3} + 3 - 9$

$= \boxed{\dfrac{16}{3}}$