Q1(1):

$$|x+3| < 4x$$

$$-4x < x+3 < 4x$$

$$x > -\frac{5}{2} \text{ and } x > 1$$

$$\boxed{x > 1}$$

Q1(2):

The solutions are:

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

$(1, 0, 3), (1, 1, 2), (1, 2, 1), (1, 3, 0),$

$(2, 0, 2), (2, 1, 1), (2, 2, 0),$

$(3, 0, 1), (3, 1, 0),$

$(4, 0, 0)$

Where there are totally $\boxed{15}$ solutions.

Q1(3):

The centre of the circle is the mid-point of OA, i.e. (3,4).

The radius of the circle=$\frac{OA}{2} = \frac{\sqrt{6^2+8^2}}{2} = 5$.

Therefore, the equation of the circle is $(x - \boxed{3})^2 + (y - \boxed{4})^2 = \boxed{5}^2$.

Q1(4):

$\log_4 9 = \frac{\log_2 9}{\log_2 4} = \log_2 9^{\frac{1}{2}} = \log_2 \boxed{3}$.

Similarly, $\log_9^4 = \log_3 \boxed{2}$.

Hence, $(\log_2 3 + \log_4 9)(\log_3 2 + \log_9 4) = (2\log_2 3)(2\log_3 2) = \boxed{4}$.

Q1(5):

$\sqrt[6]{25} \times \sqrt[3]{25} \div \sqrt{5} = \frac{\sqrt[3]{5} \cdot \sqrt[3]{5}^2}{\sqrt{5}} = \frac{5}{\sqrt{5}} = \boxed{\sqrt{5}}$.

Q1(6):

We have:

$$\begin{cases} a + ar + ar^2 = a\frac{r^3-1}{r-1} = 14......(1) \\ \\ ar + ar^2 + ar^3 = ar\frac{r^3-1}{r-1} = -42......(2) \end{cases}$$

By (2)÷(1), we have $r = \boxed{-3}$.

Substitue it into (1), we have $7a = 14$, i.e. $a = \boxed{2}$.

Q1(7):

By $|\vec{c}| = 3$, we have $x^2 + y^2 + z^2 = 9......(1)$.

As $\vec{c} \perp \vec{a}$, we have $\vec{c} \cdot \vec{a} = x - z = 0......(2)$.

Similarly, we have $\vec{c} \cdot \vec{b} = -2x + 2y + z = 0......(3)$.

Substitue (2) and (3) into (1), we have $x^2 + (\frac{x}{2})^2 + x^2 = 9$, i.e. $x = \boxed{2}$.

And then, $y = \frac{x}{2} = \boxed{1}$ and $z = x = \boxed{2}$

Q1(8):

By the cosine formula, $\cos \angle ABC = \frac{BA^2+BC^2-AC^2}{2(BA)(BC)} = \frac{36+64-16}{96} = \boxed{\dfrac{7}{8}}$.

$$AM^2 = BA^2 + BM^2 - 2(BA)(BM)\cos \angle ABC$$
$$AM = \sqrt{36 + 16 - 2(6)(4)(\frac{7}{8})} = \boxed{\sqrt{10}}$$

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Q1(9):

As $f'(x) = -2x + 1$, the slope of the tangent=$f'(0) = 1$.

By the point-slope form of straight line, the tangent is $y - 2 = 1(x - 0)$, i.e. $y = \boxed{x + 2}$.

The x-intercepts of the parabola are -1 and 2.

The x-intercept of the tangent is -2.

Therefore, the area=$\int_{-2}^{-1}(x + 2)dx + \int_{-1}^{0}((x + 2) - (-x^2 + x + 2))dx$

$= [\frac{1}{2}x^2 + 2x]_{-2}^{-1} + [\frac{1}{3}x^3]_{-1}^{0}$

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

$= \boxed{\dfrac{5}{6}}$

Q2:

(1): As $\angle ACD = 90°$, the diameter is AD.

Therefore, the radius=$\frac{AD}{2} = \frac{\frac{DC}{\cos \angle ADC}}{2} = \boxed{1}$.

(2): $BC = AC = AD \sin \angle ADC = 2 \sin 60° = \sqrt{3}$.

Therefore, $AB = \sqrt{\sqrt{3}^2 + \sqrt{3}^2} = \sqrt{6}$ and the radius=$\frac{AB}{2} = \boxed{\dfrac{\sqrt{6}}{2}}$.

(3): Consider the area of $\triangle ABC$, we have:

$$\frac{1}{2}(AC)(BC) = \frac{1}{2}(AC)(r) + \frac{1}{2}(BC)(r) + \frac{1}{2}(AB)(r)$$
$$\frac{3}{2} = (\frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} + \frac{\sqrt{6}}{2})r$$
$$r = \frac{3}{2\sqrt{3} + \sqrt{6}} = \boxed{\frac{2\sqrt{3} - \sqrt{6}}{2}}$$

(4): Note that $\angle ABC = 45°$.

Therefore, $DH = BD \sin \angle ABC = (\sqrt{3} - 1) \sin 45° = \boxed{\dfrac{\sqrt{6} - \sqrt{2}}{2}}$.

(5): Consider the sine ratio, we have $\sin \angle DAH = \frac{DH}{DA} = \boxed{\dfrac{\sqrt{6} - \sqrt{2}}{4}}$.

(6): $\cos \angle DAH = \sqrt{1 - \sin^2 \angle DAH}$

$= \sqrt{1 - (\frac{8-2\sqrt{12}}{16})}$

$= \frac{1}{4}\sqrt{8 + 2\sqrt{12}}$

$= \boxed{\dfrac{\sqrt{6} + \sqrt{2}}{4}}$

Q3:

(1): A striaght line with positive slope and x-intercept 2. The equation matches it is $\boxed{(9)}$.

(2): A stright line with positive slope and y-intercept 2. The equation matches it is $\boxed{(5)}$.

(3): A parabola convex downwards and with y-intercept 2. The equation matches it is $\boxed{(13)}$.

(4): A parabola convex upwards and with x-intercept 2. The equation matches it is $\boxed{(15)}$.

(5): A circle with centre (2,2) and radius 2. The equation is $(x-2)^2+(y-2)^2 = 4$, i.e. $x^2 - 4x + y^2 - 4y + 4 = 0$ $\boxed{(7)}$.