Q1(1):

$\sqrt{5-2\sqrt{6}}-\frac{1}{\sqrt{2}+\sqrt{3}}$

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

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

$=|\sqrt{3}-\sqrt{2}|-\frac{\sqrt{2}-\sqrt{3}}{2-3}$

$=\sqrt{3}-\sqrt{2}+\sqrt{2}-\sqrt{3}$

$=\boxed{0}$

Q1(2):

$(-2x^2y^3)^2\div(-xy^2)^3$

$=\frac{2x^4y^6}{x^3y^6}$

$=\boxed{2x}$

Q1(3):

$4^x-2^{x+1}-15=0$

$2^{2x}-2\cdot 2^x-15=0$

$(2^x-5)(2^x+3)=0$

$2^x=5$ or $2^x=-3$(rejected)

$x=\boxed{\log_2 5}$

Q1(4):

$2\cos^2 x + 3\sin x - 3 = 0$

$2(1 - \sin^2 x) + 3\sin x - 3 = 0$

$2\sin^2 x - 3\sin x + 1 = 0$

$(2\sin x - 1)(\sin x - 1) = 0$

$\sin x = \frac{1}{2}$ or $\sin x = 1$

$x = 30^\circ,\ 90^\circ$ or $\boxed{150^\circ}$ (as $0^\circ \leq x \leq 180^\circ$)

Q1(5):

Note that $a_2 - a_1 = 2 - 1 = 1$, $a_3 - a_2 = 5 - 2 = 3$, $a_4 - a_3 = 10 - 5 = 5$ and $a_5 - a_4 = 17 - 10 = 7$. It can hence be deduced that $a_{n+1} - a_n = 2n - 1$ for all $n \in \mathbb{Z}^+$, or $a_{n+1} = a_n + (2n - 1)$. Then, $a_8 = a_7 + 13 = a_6 + 11 + 13 = a_5 + 9 + 24 = 17 + 33 = \boxed{50}$.

Q1(6):

(i) By completing the square, $f(x) = x^2 - 2x + 1 - 1 - 3 = (x-1)^2 - 4$. Hence, the coordinates of the vertex are $(\boxed{1}, \boxed{-4})$.

(ii) $f(x) = 0$

$x^2 - 2x - 3 = 0$

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

$x = \boxed{-1}$ or $x = \boxed{3}$

(iii) When the graph of $y = f(x)$ is translated along the x-axis by 1 unit and the y-axis by 2 units, the graph becomes $y = f(x-1)+2$. The graph is same as that of $y = g(x)$ if and only if $g(x) = f(x-1)+2$. Then, we have $x^2+ax+b = (x-1)^2-2(x-1)-3+2 = x^2-2x+1-2x+2-1 = x^2-4x+2$, which implies $a = \boxed{-4}$ and $b = \boxed{2}$.

(iv) Let α and β $(\alpha < \beta)$ be the two roots of $g(x)$, i.e. $g(x) = (x-\alpha)(x-\beta)$.

Solving the system of inequalities $\begin{cases} f(x) < 0 \\ g(x) < 0 \end{cases}$, we have:

$$\begin{cases} x^2-2x-3 < 0 \\ (x-\alpha)(x-\beta) > 0 \end{cases}$$

$$\iff \begin{cases} (x-3)(x+1) < 0 \\ x < \alpha \text{ or } x > \beta \end{cases}$$

$$\iff \begin{cases} -1 < x < 3 \\ x < \alpha \text{ or } x > \beta \end{cases}$$

$$\iff -1 < x < \alpha \text{ or } \beta < x < 3$$

When $-1 < x < 1$ or $2 < x < 3$, we have the two roots of $g(x)$ are 1 and 2, i.e. $g(1) = g(2) = 0$. By solving the system of equations $\begin{cases} g(1) = 0 \\ g(2) = 0 \end{cases}$, we have

$$\begin{cases} 1+a+b = 0 ......(1) \\ 4+2a+b = 0 ......(2) \end{cases}.$$

Subtract (1) from (2), we have $3+a = 0$, i.e. $a = \boxed{-3}$. Then, substitute $a = -3$

into (1), we have $1-3+b=0$, i.e. $b=\boxed{2}$.

(v) As $f'(x)=2x-2$, we have $f'(2)=2\cdot 2-2=\boxed{2}$.

On the other hand, $\int_0^3 f(x)dx = \int_0^3 (x^2-2x-3)dx = \frac{1}{3}x^3 - x^2 - 3x|_0^3 = \frac{3^3}{3} - 3^2 - 3\cdot 3 - \frac{0^3}{3} + 0^2 + 3\cdot 0 = 9-9-9 = \boxed{-9}$.

Q2:

(1) $\tan\alpha = $ Slope of AB $= \boxed{3}$.

(2) **Lemma:** From the equality $\sin^2 x + \cos^2 x = 1$ for all $x \in \mathbb{R}$, dividing both sides by $\cos^2 x$, we can get the equality $\tan^2 x + 1 = \frac{1}{\cos^2 x}$ for all $x \in \mathbb{R}$.

We have $\sin^2\alpha = 1-\cos^2\alpha = 1 - \frac{1}{\frac{1}{\cos^2\alpha}}$. Then, by **Lemma**, we have $\sin^2\alpha = 1 - \frac{1}{\tan^2\alpha+1} = 1 - \frac{1}{3^2+1} = 1-\frac{1}{10} = \frac{9}{10}$. Hence, $\sin\alpha = \sqrt{\frac{9}{10}} = \frac{3}{\sqrt{10}} = \boxed{\frac{3}{10}\sqrt{10}}$.

Alternative: Geometrically, consider the tangent ratio of $\triangle ABC$, we have $\tan\alpha = \mathrm{AC} : \mathrm{AB} = 3:1$. Then, we may let $\mathrm{AC} = 3k$ and $\mathrm{AB} = k$. By Pythagoras's theorem, we have $BC = \sqrt{k^2+(3k)^2} = \sqrt{10}k$. Hence, by considering the sine ratio of $\triangle ABC$, we have $\sin\alpha = \mathrm{AC} : \mathrm{BC} = (3k) : (\sqrt(10)k) = \frac{3}{\sqrt(10)} = \boxed{\frac{3}{10}\sqrt{10}}$.

(3) We have $\cos\alpha = \frac{\sin\alpha}{\tan\alpha} = \frac{\frac{3}{10}\sqrt{10}}{3} = \frac{\sqrt{10}}{10}$.

On the other hand, we have the y-coordinate of A=the y-intercept of AB=4 and the x-coordinate of B=the x-intercept of AB=$-\frac{4}{3}$. Hence, we have $AB = \sqrt{(-\frac{4}{3})^2+4^2} = \frac{4}{3}\sqrt{1+9} = \frac{4}{3}\sqrt{10}$.

Combine the above two results, using the cosine ratio of $\triangle ABC$ we have $\cos\alpha = \frac{\text{AB}}{\text{BC}} = \frac{\sqrt{10}}{10}$. Hence, we have $\text{BC} = \frac{10\text{AB}}{\sqrt{10}} = \frac{10\cdot\frac{4}{3}\sqrt{10}}{\sqrt{10}} = \frac{40}{3}$.

Then, as (the x-coordinate of C)$-$(the x-coordinate of B)=BC, we have the x-coordinate of C=BC+(the x-coordinate of B)$=\frac{40}{3}+(-\frac{4}{3}) = \frac{36}{3} = 12$. Hence, the coordinates of C are $\boxed{(12,0)}$.

Alternative: By doing part (4) first using the alternative method suggested, we can get the equation of AC, which is $y = -\frac{1}{3}x+4$, without using the coordinate of C. Then, the x-coordinate of C=the x-intercept of AC=12. Hence, we have the coordinates of C are $\boxed{(12,0)}$.

(4) Consider the points A and C, we have the slope of AC$=\frac{4-0}{0-12} = -\frac{1}{3}$.

Using the slope-intercept form of straight line with the point A, we have the equation fo AC is $\boxed{y = -\dfrac{1}{3}x+4}$.

Alternative: As AB and AC are orthogonal to each other, we have the relation (Slope of AB)(Slope of AC)$= -1$. Then, we have the slope of AC$=-\frac{1}{\text{Slope of AB}} = -\frac{1}{3}$. Using the slope-intercept form of straight line with the point A, we have the equation fo AC is $\boxed{y = -\dfrac{1}{3}x+4}$.

(5) By using the mid-point theorem of vector, we have $\vec{AM} = \boxed{\dfrac{1}{2}}\vec{AB} + \boxed{\dfrac{1}{2}}\vec{AC}$.

Now, $\vec{MA}\cdot\vec{AC} = -\vec{AM}\cdot\vec{AC} = -(\frac{1}{2}\vec{AB}+\frac{1}{2}\vec{AC})\cdot\vec{AC} = -\frac{1}{2}(\vec{AB}\cdot\vec{AC}+\vec{AC}\cdot\vec{AC})$.

As $\vec{AB}\perp\vec{AC}$, we have $\vec{AB}\cdot\vec{AC} = 0$. On the other hand, $\vec{AC}\cdot\vec{AC} = |\vec{AC}|^2 = \sqrt{3^2+12^2}^2 = 9+144 = 153$. Therefore, we have $\vec{MA}\cdot\vec{AC} = -\frac{1}{2}(0+153) = \boxed{-\dfrac{153}{2}}$.