Q1(1):

$(-2x^2y)^3 \div x^5y \div (-2x^2y^2)$

$= \frac{-8x^6y^3}{-2x^7y^3}$

$= \boxed{\dfrac{4}{x}}$

Q1(2):

$\frac{\sqrt{5}}{\sqrt{3}+1} - \sqrt{\frac{30}{8}} + \frac{\sqrt{45}}{2}$

$= \frac{\sqrt{15}-\sqrt{5}}{2} - \frac{\sqrt{15}}{2} + \frac{3\sqrt{5}}{2}$

$= \boxed{\sqrt{5}}$

Q1(3):

Note that $(x+1)(2x+3) = 2x^2+5x+3$.

Therefore, the identity is equivalent to $a(2x+3) - b(x+1) = x+4$.

Putting $x=-1$ to cancel the b term, we have $a = \boxed{3}$.

Putting $x = -\frac{3}{2}$ to cancel the a term, we have $\frac{1}{2}b = \frac{5}{2}$, i.e. $b = \boxed{5}$.

Alternative By $(2a-b)x + (3a-b) = x+4$, comparing the coefficients, we have:

$$\begin{cases} 2a - b = 1 \\ 3a - b = 4 \end{cases}$$

Solving, we have $a = \boxed{3}$ and $b = \boxed{5}$

Q1(4):

Let n be the largest one among the four numbers, we have

$$n + (n-2) + (n-4) + (n-6) = 224$$

$$4n = 236$$

$$n = \boxed{59}$$

Q1(5):

$$8^x < \frac{1}{4}$$

$$2^{3x} < 2^{-2}$$

$$3x < -2$$

$$x < -\frac{2}{3}$$

Therefore, the largest integer satisfying it is $\boxed{-1}$.

$$2 < \log_x 45 < 3$$

$$x^2 < 45 < x^3$$

$$3 = \sqrt[3]{27} < \sqrt[3]{45} < x < \sqrt{45} < \sqrt{49} = 7$$

Therefore, there are $\boxed{3}$ integers $4, 5, 6$ satisfying it.

Q1(6):

As $x = 1$ is a root, we have $1 + a + 1 + 1 = 0$, i.e. $a = \boxed{-3}$.

Moreover, we can do the factorisation by the long division.

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

$$(x - 1)(x^2 - 2x - 1) = 0$$

$$x = 1, \boxed{-1 \pm \sqrt{2}}$$

Q1(7):

When $\cos\theta = -\frac{1}{2}$ for $90° \leq \theta \leq 180°$, we have $\theta = \boxed{120°}$.

By $\sin^2\theta + \cos^2\theta = 1$, we have $\cos^2\theta = 1 - \sin^2\theta = 1 - (\frac{3}{5})^2 = \frac{16}{25}$.

As $\cos\theta \leq 0$ for $90° \leq \theta \leq 180°$, we have $\cos\theta = -\sqrt{\frac{16}{25}} = \boxed{-\dfrac{4}{5}}$.

Q1(8):

To choose three numbers and arrange them to a three-digit integer, there are $P_3^5 = \boxed{60}$ ways.

If the integer is greater than 400, the leading digit is either 4 or 5 (2 choices).

To choose the remaining two digits among the 4 numbers, there are $P_2^4 = 12$ ways. Therefore, there are together $2 \cdot 12 = \boxed{24}$ different integers.

Q1(9):

$$\vec{x} - \vec{a} = \vec{b} - \vec{x}$$

$$2\vec{x} = \vec{a} + \vec{b}$$

$$\vec{x} = \frac{1}{2}(< 2, 3 > + < -1, 4 >) = \frac{1}{2} < 1, 7 >= \boxed{< \frac{1}{2}, \frac{7}{2} >}$$

Q1(10):

(i): $f'(x) = \boxed{-3x^2 + 12x - 9}$.

(ii): To find the extremum of $f(x)$, we set $f'(x) = 0$. For $0 \leq x \leq 3$, we have $x = 1$ or $x = 3$.

We test the minimum by exhaustion:

$f(0) = 1$

$f(1) = -3$

$f(3) = -3$

Therefore, the minimum value of $f(x)$ is $\boxed{-3}$.

Q2:

(1): By completing the square, we have $y = (x - 2)^2 - 9$.

Therefore, the vertex of A is $\boxed{(2, -9)}$.

To find the x-intercepts, we are going to solve

$$x^2 - 4x - 5 = 0$$

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

$$x = \boxed{-1, 5}$$

(2): After the transformation, (x, y) becomes $(-x, -y)$.

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

(3): When $y = 2x + k$ touches A, the equation $2x + k = x^2 - 4x - 5$ has only one solution. Therefore,

$$\Delta = 36 + 4(5 + k) = 0$$

$$k = \boxed{-14}$$

By that time, the x-coordinate of the point of tangent can be found

$$x^2 - 6x + 9 = 0$$

$$x = 3$$

Therefore, the area=$\int_0^3((x^2 - 4x - 5) - (2x - 14))dx$

$= [\frac{1}{3}x^3 - 3x^2 + 9x]_0^3$

$= 9 - 27 + 27$

$= \boxed{9}$

Q3:

(1): The graph is a straight line with positive slope and positive y-intercept. The symmetric graph will have a negative slope. It can hence be deduced that the equation of it is $\boxed{(4)}$.

(2): The graph is a exponential function $y = a^x$ with $a > 1$ as the graph is increasing. The symmetric graph will be decreasing, i.e. $a < 1$. Therefore, the equation is $\boxed{(14)}$.

(3); The graph is a circle with the y-coordinate of centre 0 and the x-coordinate of centre is negative. The symmetric graph will have a positive x-coordinate of centre. It can hence be deduced that the equation of it is $\boxed{(11)}$.

(4): The graph is a sine wave that passes through the origin and increasing for the first half period, which has the equation $y = \sin x$. Therefore, the equation of the symmetric graph will be $y = \sin(-x) = -\sin x$ $\boxed{(3)}$.

(5): The graph is a parabola with the right part taken the absolute value. The symmetric graph will have the left part taken the absolute value. Therefore, the equation is $\boxed{(8)}$.