Question 1: For this question use the following sets:

$$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}, \quad M = \{0, 2, 4, 6, 8\}, \quad N = \{1, 3, 5, 7, 9, 11, 13\},$$

$$Q = \{0, 2, 4, 6, 8, 10, 12\}, \quad R = \{0, 1, 2, 3, 4\}$$

Determine the following:

(a) $M \cap R$

[2]

(b) $M \cup R$

[2]

(c) $M' \cap N$

[3]

(d) $(M' \cup Q) \cap R$

[3]

Question 2:

(a) Let $p = -4$, $q = 8$ and $r = -10$. Evaluate $\dfrac{\left(\frac{q}{2} - \frac{r}{3}\right)}{\left(\frac{3p}{4} + \frac{q}{8}\right)}$.

[4]

(b) Simplify $-\frac{1}{4}(20m + 8y - 32z)$.

[3]

(c) Let $x = -4$ and $y = 2$. Evaluate $\dfrac{|x| + 2|y|}{-|xy|}$.

[3]

Question 3:

(a) Simplify $(-4xy^3)(7x^2y)$.

[2]

(b) Expand (that is, find the product and simplify): $(3w+2)(-w^2+4w-3)$.

[3]

(c) Perform the division : $\dfrac{x^4+5x^2+5x+27}{x^2+3}$

[5]

Question 4:

(a) Factor completely: $10ab - 6b + 35a - 21$.

[2]

(b) Factor completely: $36x^3 + 18x^2 - 4x$.

[2]

(c) Factor completely: $(x-4)^3 + 64$

[3]

(d) Factor completely: $a^4 - 3a^2 - 54$

[3]

Question 5:

(a) Find the following product and express your answer in lowest terms:

$$\frac{6x-18}{9x^2+6x-24} \bullet \frac{12x-16}{4x-12}$$

[5]

(b) Perform the following subtraction and express your answer in lowest terms:

$$\frac{3x}{x^2+x-12} - \frac{x}{x^2-16}$$

[5]