Question 1: For this question use the following sets:

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

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

Using these, find each of the following:

(a) $M \cup Q$

[2]

(b) $Q \cap R'$

[3]

(c) $(N \cup R) \cap M$

[5]

Question 2:

(a) Evaluate $\dfrac{15 \div 5 \bullet 4 \div 6 - 8}{-6 - (-5) - 8 \div 2}$

[3]

(b) Evaluate the following expression if $p = -4$, q=8 and $r = -10$:

$$\frac{\left(\frac{q}{4} - \frac{r}{5}\right)}{\left(\frac{p}{2} + \frac{q}{2}\right)}$$

[3]

(c) Evaluate the following expression if $x = -4$ and $y = 2$:

$$\frac{|-8y + x|}{-|x|}$$

[4]

Question 3:

(a) Simplify (assume the variables represent nonzero real numbers):

$$\left(\frac{-5n^4}{r^2}\right)^3$$

[2]

(b) Find the product:

$$(r-3s+t)(2r-s+t)$$

[3]

(c) Perform the division

$$\frac{x^4-4x^2+2x+5}{x^2+1}$$

[5]

Question 4: Factor completely:

(a) $8x^2 - 2x - 21$

[3]

(b) $125x^3 - 27$

[3]

(c) $6p^4 + 7p^2 - 3$

[4]

Question 5:

(a) Write in lowest terms: $\dfrac{r^2 - r - 6}{r^2 + r - 12}$

[4]

(b) Find the following product and write your answer in lowest terms:

$$\frac{x^2 + 2x - 15}{x^2 + 11x + 30} \bullet \frac{x^2 + 2x - 24}{x^2 - 8x + 15}$$

[6]