Question 1:

(a) Simplify to a single real number: $\dfrac{r^{-1}+q^{-1}}{r^{-1}-q^{-1}} \cdot \dfrac{r-q}{r+q}$

[3]

(b) Simplify: $\dfrac{4(x^2-1)^3 + 8x(x^2-1)^4}{16(x^2-1)^3}$

[4]

(c) Rationalize the denominator.

$$\frac{a}{\sqrt{a+b}-1}$$

[3]

Question 2:

(a) Solve for x:
$$4(-2x + 1) = 6 - (2x - 4)$$

[3]

(b) Solve for x:
$$\frac{1}{15}(2x + 5) = \frac{x + 2}{9}$$

[3]

(c) $750 is invested for 36 months at a certain rate of simple interest. At the end of the 36 months the total value of the investment is $840. What is the rate of simple interest? (Express your answer as a percentage rounded to two decimal places.)

[4]

Question 3:

(a) $10,000 is split between two investments: one pays 3% simple interest and the second pays 5% simple interest. After two years the investments have earned $840 interest in total. How much was originally invested at the 5% rate? (Round your answer to the nearest dollar.)

[5]

(b) Mary and Janet run a race. Mary runs at 14 km/h while Janet runs at 10 km/h. If they start at the same time, how long will it take them to be 3 km apart? (Round your answer to one decimal place.)

[5]

Question 4:

(a) Solve for x:

$$-3x^2 + 4x = -1$$

[5]

(b) A picture is of size 10 inches by 12 inches and we wish to put a border around the outside. The border will have an area of 48 square inches and have the same width on all four sides. Determine the width of the border.

[5]

Question 5:

(a) Solve for x:

$$\frac{2x+1}{x-2} + \frac{3}{x} = \frac{-6}{x^2-2x}$$

[5]

(b) Solve for x:

$$\sqrt{x+2} = 1 - \sqrt{3x+7}$$

[5]