Question 1: Let

$$f(x) = \begin{cases} 5 - x \text{ if } x < 1 \\ 1 + 4x \text{ if } x \geq 1 \end{cases}$$

(i) Find $f(2)$

[1]

(ii) Find $f(0)$

[1]

(iii) Graph $y = f(x)$

[3]

Question 2: Let $f(x) = 1 + x^2$. Find and simplify $\dfrac{f(x+h) - f(x)}{h}$.

[5]

Question 3: Let $f(x) = \sqrt{x+4}$ and $g(x) = \dfrac{-2}{x}$.

(i) Find $(g \circ f)(x)$

[2]

(ii) Determine the domain of $(g \circ f)(x)$.

[3]

Question 4: Let $f(x) = 2x^2 - 4x + 5$. Find

(i) the vertex (h, k) .

[2]

(ii) axis of symmetry.

[1]

(iii) domain of f.

[1]

(iv) range of f.

[1]

Question 5: The cost to produce x units of a certain product is given by $C(x) = x^2 - 140x + 7400$. How many units should be produced to minimize the cost?

[5]

Question 6: Use synthetic division to determine the quotient: $\dfrac{5x^4 + 5x^3 + 2x^2 - x - 3}{x + 1}$

[5]

Question 7: Factor completely: $f(x) = 6x^3 + 13x^2 - 14x + 3$

[5]

Question 8: Determine the value of k so that $\dfrac{x^3 - 3x^2 + kx - 4}{x - 2}$ has remainder 5.

[5]

Question 9: For this question use the polynomial function

$$f(x) = x^2(x-3)^3(x+1)$$

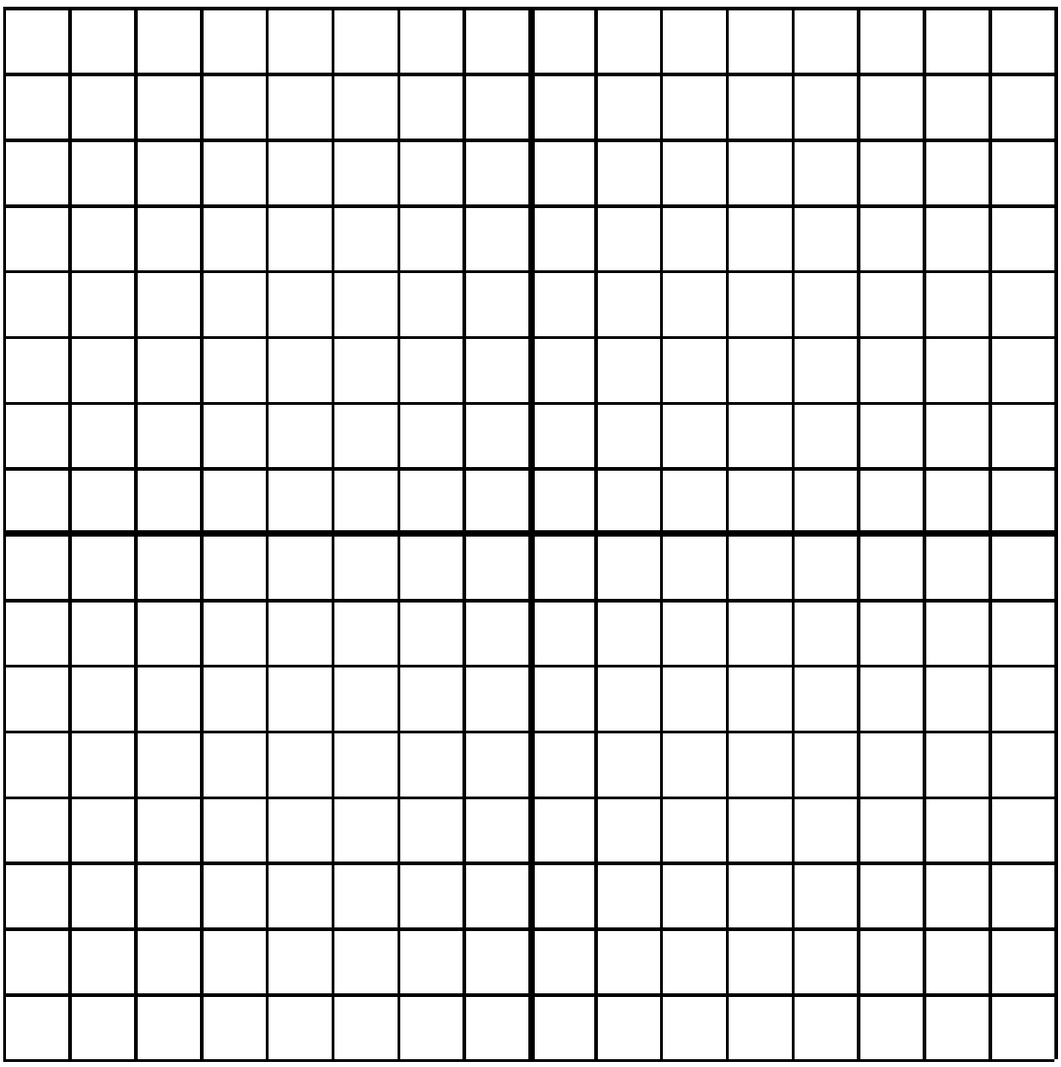
(i) State the zeros of f.

[2]

(ii) Determine the y-intercept.

[2]

(iii) Sketch an approximate graph of $y = f(x)$ showing the correct behaviour of the curve at the zeros, the y-intercept, and the correct end behaviour.



[6]