1 Maths Review Questions - Set 1

1.1 Sets and numbers
Let \( A = \{1, 2, 3, \ldots, 10\} \), \( B = \{0, 0.5, \sqrt{2}, 2, 10\} \), \( \mathbb{R} \) be the real numbers, \( \mathbb{N} \) be the natural numbers, \( \mathbb{Z} \) be the integers and \( \mathbb{Q} \) be the rationals. In each case below, describe the content of the set \( C \)

1. \( C = \{x \in A : x > 6\} \)
2. \( C = A \cup B \)
3. \( C = A \cap B \)
4. \( C = A \setminus B \)
5. \( C = B \cap \mathbb{R} \)
6. \( C = B \cap \mathbb{N} \)
7. \( C = B \cap \mathbb{Z} \)
8. \( C = B \cap \mathbb{Q} \)
9. \( C = \mathbb{Z} \setminus \mathbb{N} \)
10. \( C = \mathbb{N} \setminus \mathbb{Z} \)

1.2 Derivatives
Take the first derivatives of the following functions

1. \( f(x) = (x^2 + x)(x^3 - 3x^2) \)
2. \( f(x) = \frac{(x^2 + x)}{(x^3 - 3x^2)} \)
3. \( f(x) = (2x^2 + 3x)^{3/2} \)
4. \( f(x) = \log(x^2) \)
5. \( f(x) = e^{x^2} \)

Take the first and second derivatives of these functions

1. \( f(x) = 6x^3 + 4x^2 + x \)
2. \( f(x) = \log(x) \)
3. \( f(x) = e^{x^2} \)

Take all the partial derivatives of the following functions
1. $f(x, y, z) = xyz + x^2y + z^3$
2. $f(x, y) = xy(y^2 + x^2)$
3. $f(x, y) = x \log y$

For the following two functions, sketch a graph of the isoquants for $f(x_1, x_2)$ equals 1, 2 and 5 in $x_1, x_2$ space. Write down an equation for the slope of the isoquants

1. $f(x_1, x_2) = x_1 + \frac{x_2}{2}$
2. $f(x_1, x_2) = x_1x_2$