1. (10 points) Consider the following relation
\[ y(y^2 - 1)(y - 2) = x(x^3 - 1)(x^3 - 2) \]
(a) Graph the relation on \([-1, 2] \times [-2, 3]\) and draw the graph below,

![Graph](image)

(b) Find all of the points on the curve that have horizontal tangent lines. Use at least 6 decimal places in all of your answers.

\[(1.151592564, -0.9471924651), (1.151592564, 1.9471924651), (1.151592564, -0.1368940014)\]
\[(1.151592564, 1.1368940001), (0.5719329709, -1.114784635), (0.5719329709, 2.114784635)\]
2. (10 points) Consider the following function

\[ f(x) = \frac{1}{x} + \frac{1}{x^2} \]

(a) Use Maple to find the first 10 derivatives of the function and write them below.

\[ f'(x) = -\frac{x + 2}{x^3} \]
\[ f''(x) = 2 \frac{x + 3}{x^4} \]
\[ f'''(x) = -6 \frac{x + 4}{x^5} \]
\[ f^{(4)}(x) = 24 \frac{x + 5}{x^6} \]
\[ f^{(5)}(x) = -120 \frac{x + 6}{x^7} \]
\[ f^{(6)}(x) = 720 \frac{x + 7}{x^8} \]
\[ f^{(7)}(x) = -5040 \frac{x + 8}{x^9} \]
\[ f^{(8)}(x) = 40320 \frac{x + 9}{x^{10}} \]
\[ f^{(9)}(x) = -362880 \frac{x + 10}{x^{11}} \]
\[ f^{(10)}(x) = 3628800 \frac{x + 11}{x^{12}} \]

(b) Using the derivatives above find a formula for \( f^{(n)}(x) \).

\[ f^{(n)}(x) = (-1)^n n! \frac{x + (n + 1)}{x^{n+2}} \]

(c) Using your formula for \( f^{(n)}(x) \) find \( f^{(5000)}(x) \).

\[ f^{(1000)}(x) = 5000! \frac{x + 5001}{x^{5002}} \]