Evaluate the anti-derivatives:

1. \( \int (3x^{16} + 5\sqrt{x} - 2x^{-6}) \, dx = \)

2. \( \int (17\cos(x) + 11\sin(x) - 2x^6) \, dx = \)
1. (40 points: a) 15, b) 10, c) 10, and 5 for consistency) \( f(x) = x^4 + 2x^3 - 10x^2 + 1 \)

   a) Find the exact x value of each critical point. Find (to 3 decimal places) the approximate values of x and f(x) for each critical point. Classify each critical point.

   b) Find the exact x value of each point of inflection. Find (to 3 decimal places) the approximate values of x and f(x) for each inflection point.

   c) Graph \( f(x) \) on the grid below, showing all points found in parts (a) and (b) above. (Be sure to indicate the scales you are using.)
2. (15 points)
   a) Draw the first 2 iterations of Newton’s method starting at \( x_0 = 0 \) on the graph of \( f \) below (i.e., find \( x_1 \) and \( x_2 \) graphically)

   b) \( f(x) = \cos x - x \). Carry out the first 2 iterations of Newton’s method numerically starting at \( x_0 = 1 \) (i.e., find \( x_1 \) and \( x_2 \) numerically). Your answers should have at least 5 digits after the decimal place.

3. (15 points) Solve the differential equation \( \frac{dy}{dx} = (x + 3)\sqrt{y} \) with initial condition \( y(0) = 1 \).

Extra credit (3 points): Briefly describe a practical application of the Mean Value Theorem.