1. (10 points) Answer the following questions about the function \( g(x) = \sqrt[4]{(x + 4)^2(x^2 - 1)} \).

   (a) Is it a polynomial?

   \[
   \text{Yes, note that the coefficients can be any real number, the powers of the x's have to be integers. E.g. } \sqrt[3]{x} \text{ is a poly, } 3\sqrt{x} \text{ is not.}
   \]

   (b) If yes what is the degree?

   \[
   5, \quad (x+4)^3 \text{ gives 3 degrees, } (x^2-1) \text{ gives the other two.}
   \]

   (c) If not why not?

2. (10 points) Construct a polynomial whose graph touches the x-axis at -1 and 2 and crosses the x-axis at 3 and -5.

   \[
   \begin{array}{c|c|c}
   \text{Zeros} & \text{Multiplicity} & \text{Factorization} \\
   \hline
   -1 & \text{even (touch)} & (x+1)^2 \\
   2 & \text{even (touch)} & (x-2)^2 \\
   3 & \text{odd (cross)} & (x-3)^3 \\
   -5 & \text{odd (cross)} & (x+5)^1 \\
   \end{array}
   \]

   +1 for each correct factor
   +1 for each correct power
   +1 for touch, even, cross = odd

   \[ p(x) = (x+1)^2(x-2)^2(x-3)^3(x+5) \]

3. (Bonus +2) Solve \(-2x^2 - 4x - 5 > 0\).

   Finding zeros
   \[
   x = \frac{4 \pm \sqrt{16 - 4(-5)}}{2}\]
   \[
   = \frac{4 \pm \sqrt{36}}{-2} = \frac{4 \pm 6}{-2} = 0 \text{ no zeros}
   \]

   Thus \(-2x^2 - 4x - 5\) is never above the x-axis so \(-2x^2 - 4x - 5 > 0\) is the empty set, or the set of x-values so that \(-2x^2 - 4x - 5 > 0\) is empty.