1. Does the differential equation \( x^2 \frac{d^2 y}{dx^2} - 5x \frac{dy}{dx} + 5y = x^6 \) have any solutions of the form \( y = ax^6 + bx^5 + cx \)? If so, what restrictions are there on the constants \( a, b, c \)?

2. An oceanfront city has the shape of an isosceles triangle with base on the ocean. We assume the coastline is straight and 12 miles long. The other two sides have length \( 6\sqrt{2} \) miles, which means that the height of the triangle is 6 miles. If the population density is \( 10000e^{-x} \) people per square mile, where \( x \) is the distance from the ocean, write down an integral that equals the total population of the city. For extra credit, evaluate the integral.