Calculus

Instructions   Please write your name in the upper right-hand corner of the page. Write complete sentences to explain your solutions.

1. What function $f(x)$ do you know such that some antiderivative of $f(x)$ is equal to $f(x)$? Is there more than one such function?

2. Show that the point on the parabola $x + y^2 = 0$ closest to the point $(0, -3)$ is the point $(-1, -1)$.
   [This is exercise 16 on page 337 of the textbook.]

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3. Find a function $f(x)$ such that $f'''(x) = \sin x$, $f(0) = 1$, $f'(0) = 1$, and $f''(0) = 1$.
   [This is exercise 40 on page 354 of the textbook.]

4. Suppose $f(x) = x^4 - cx^2 + x$, where c is a constant (possibly positive or negative or zero). For what range of values of c does the graph of f have no inflection points? one inflection point? two inflection points?
   [This is based on exercise 26 on page 331 of the textbook.]