MA 16010 Quiz 3

Simplify your final answer. Show all relevant work for each problem. Little to no work, even with a correct answer, will receive little to no credit.

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1. Find the equation of the tangent line to the graph of $f(x) = x^3 + 7e^x - 4\cos(x)$ at $x = 0$.

Point: $(0, f(0)) = (0, 0+7e^0 - 4\cos(0)) = (0, 3)$

Slope: $f'(x) = 3x^2 + 7e^x + 4\sin(x)$

$f'(0) = 0 + 7e^0 + 4\sin(0) = 0 + 7 + 0 = 7$

$y - 3 = 7(x-0) \Rightarrow \boxed{y = 7x + 3}$

2. The population of a city since the year 2000 can be modeled as $p(t) = 900t^2 - 800t + 20000$. Where $t = 0$ corresponds to the year 2000. In which year is the population increasing at a rate of 10000 people per year?

Rate of change $= P'(t) = 1800t - 800$

$1800t - 800 = 10000$

$1800t = 10800$

$t = 6$ $\Rightarrow \boxed{\text{Year} = 2006}$