

- (1) (5 points) A certain city had a population of 20,000 in 1980 and a population of 25,000 in 1990. Assume that its population will continue to grow exponentially at a constant rate. What population can its city planners expect in year 2000? (Do not simplify your answer!)

(1 point) any work.

(1 point) writing the equation or solution form ($P' = kP$ or $P = P_0e^{kt}$).

(1 point) finding $k = \ln(25.000/20.000)/10$.

(1 point) $P(t) = 20.000e^{\frac{\ln(25.000/20.000)}{10}t}$

(1 point) $P(20) = 20.000e^{\frac{\ln(25.000/20.000)}{10}20}$

Note; Simplification is not requires, so if they make any mistake while trying to simplify, lets do not deduct any point!

- (2) (5 points) Find a general solution of the differential equation, $y' + 3y = 2xe^{-3x}$.

(1 point) any work.

(1 point) recognizing that it is linear.

(1 point) computing $e^{\int 3dx} = e^{3x}$ and writing $y'e^{3x} + 3ye^{3x} = 2xe^{-3x}e^{3x}$

(1 point) $(ye^{3x})' = \int 2xdx$

(1 point) $y = \frac{x^2 + C}{e^{3x}}$.