Section 3.5 - Applications

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Salt water of concentration 0.1 pound of salt per gallon flows into a large tank that initially contains 50 gallons of pure water.

a) If the flow rate of salt water into the tank is 5 gal/min, find the volume V(t) of water and the amount A(t) of salt water after t minutes.
b) Find a formula for the salt concentration c(t) (in lb/gal) after t minutes.
c) Discuss the variation of c(t) as $t \to \infty$.

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The population density D (in people /square mile) in a large city is related to the distance x (in miles) from the center of the city by $D = \frac{5000x}{x^2 + 36}$.

a) What happens to the density as the distance from the center of the city changes from 20 miles to 25 miles?
b) What eventually happens to the density?
c) In what areas of the city does the population density exceed 400 people/sq.mi ?

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A rectangle made of elastic material is to be made into cylinder by joining edge AD to edge BC (the widths). A wire of fixed length l is placed along the diagonal of the diagonal to support the structure. Let x denote the height of the cylinder.

a) Express the volume V of the cylinder in terms of x.
b) For what positive values of x is V>0 ?