

Problem Set 19

1) Find the family of curves orthogonal to the family of circles centered at the origin.

2) Find the family of curves orthogonal to  $y = \tan kx$ .

3) (9.3.15) A tank contains 100 gal of fresh water. A solution containing 1 lb/gal of soluble lawn fertilizer runs into the tank at the rate of 1 gal/min, and the mixture is pumped out of the tank at the rate of 3 gal/min. Find the maximum amount of fertilizer in the tank and the time required to fill it.

4) (9.3.16) An executive conference room of a corporation contains  $4500 \text{ ft}^3$  of air initially free of carbon monoxide. Starting at time  $t = 0$ , cigarette smoke containing 4% carbon monoxide is blown into the room at the rate of  $0.3 \text{ ft}^3/\text{min}$ . A ceiling fan keeps the air in the room well circulated and the air leaves the room at the same rate. Find the time when the concentration of carbon monoxide in the room reaches 0.01%.