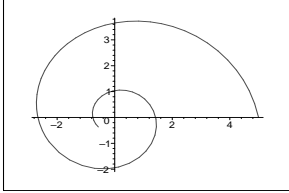


Name _____

1. A spiral is given by the parametric equations :



$$\begin{aligned}x(t) &= 5e^{-0.2t} \cos t \\y(t) &= 5e^{-0.2t} \sin t\end{aligned}$$

- (a) Determine the arclength of the spiral for $0 \leq t \leq 10$.

- (b) Now determine the arclength of the spiral on $[0, \infty)$. (This is an improper integral.)

2. Given the differential equation: $y' - 2xy = x$

- (a) What is the integrating factor?

- (b) Determine the general solution.

3. Given the differential equation: $x^2y' + y = 1$

(a) What is the integrating factor?

(b) Determine the solution such that $y(1) = 0$.

4. Given the differential equation: $y' - (\cos 2x)y = \cos 2x$

(a) What is the integrating factor?

(b) Determine the solution such that $y(\pi/2) = 3$.

5. A tank initially contains 50 gal of brine in which 5 lb of salt is dissolved. Brine containing 1 lb of salt per gallon flows into the tank at a constant rate of 4 gal/min. The concentration of brine in the tank is kept uniform and brine is drawn off at a rate of 2 gal/min. Find the amount of salt in the tank after 25 minutes. (Notice this is not separable since the amount of solution is not kept constant but it can be written in the form $y' + P(x)y = Q(x)$.)