

3. Starlings are introduced to an island with no previous starlings on it. Twelve pairs of starlings are placed on the island. The growth rate of this population of starlings is proportional to the square of the number of pairs of starlings present. Two years later there are 24 pairs on the island. When will there be 48 pairs on the island?
- Write the differential equation.
 - Solve the differential equation and use it to find the time requested.

4 a. Find the general solution to the differential equation $y'' - 6y' + 5y = 3x + 2e^{5x}$.

b. Then suppose that $y(0) = 18/25$ and $y'(0) = 3/5$. Solve the resulting initial value problem.

5. Use the definition of the Laplace transform to find the Laplace transform of the function $f(t) = e^{-7t}$

6. Find the Laplace transforms of the following:

a. $\sin(3t) - 17\cos(6t) - 7t^5$

b. $(\cos(4t) + e^3 - 5t^6) \cdot e^{5t}$

7. Find the inverse Laplace transforms of the following:

a. $\frac{-11}{s^3} - \frac{2 + 7s}{s^2 + 81}$

b. $\left(\frac{2}{(s + 5)^4} - \frac{s - 2}{(s - 2)^2 + 36} \right)$