

1. Consider the equation $y'' = y$. Sketch the solutions c with $y(0) = 1$ and $y'(0) = 0$ and s with $y(0) = 0$ and $y'(0) = 1$. Show that $c^2(t) - s^2(t) = 1$ for all t . Also, prove that $c' = s$ and $s' = c$.
2. Find the solution of the initial value problem $y'' + 4y' + 5y = 0$, $y(0) = 1$, $y'(0) = 0$.
3. Let $x_0 = x_1 = 1$. Add both numbers to obtain x_2 , then add x_1 and x_2 to obtain x_3 and so on. Find a formula for x_n , $n = 0, 1, 2, \dots$
4. A mass weighing 2 lb stretches a spring 6 inches. At time 0 the mass is released from a point 8 inches below the equilibrium position with upward velocity of $\frac{4}{3}$ ft/sec. Determine the function $x(t)$ which describes the subsequent free motion of the mass (ignoring any damping forces). Carefully plot x . Express $x(t)$ in the form $r \sin(\omega t + \theta)$. Find the period, frequency, and amplitude of the motion.