

3. Given that $y'' + 25y = 0$ has linearly independent solutions $y_1 = \sin 5x$ and $y_2 = \cos 5x$, find the particular solution of the differential equation for which $y(0) = 10$ and $y'(0) = -10$.

4. Find the general solution of each second order differential equation.

a. $y'' + 2y' - 15y = 0$

b. $3y'' + 6y' + 3y = 0$.

5. Determine if the functions $f(x) = 1 + x$ and $g(x) = 1 + |x|$ are linearly independent or linearly dependent on the real line. Justify your answer.
6. Compute the Wronskian of the functions $f_1(x) = 1 + x$, $f_2(x) = 1 - x$, and $f_3(x) = x^2$.
7. **A modified drug model.** As in the drug model from your assignment, assume that a person ingests a drug, which enters into the GI tract at a rate specified by the function $dose(t)$ at time t . As before, assume the drug enters into the circulatory system at a rate proportional to the drug level in the GI tract. Also as before, assume that the drug exits the circulatory system through metabolism at a rate proportional to the drug level in the blood. Create a three compartment model to accommodate the following additional assumption: *Some of the drug is deposited from the blood stream into the bones at a rate proportional to the drug level in the blood stream (but different than the rate of metabolism).*

8. Suppose that a particular car starting from rest has an engine providing acceleration of 10 ft/sec^2 , while air resistance provides 0.1 ft/sec^2 of deceleration for each foot per second of the car's velocity. Find the car's maximum velocity.