

Week 9 Practice

October 23, 2019

1. Determine whether the given set of functions is linearly independent or not:

(a) $f_1(x) = x$, $f_2(x) = x^2$, $f_3(x) = 4x - 3x^2$;

(b) $f_1(x) = e^x$, $f_2(x) = e^{-x}$;

(c) $f_1(x) = 1$, $f_2(x) = \sin x$, $f_3(x) = \cos x$;

(d) $f_1(x) = x$, $f_2(x) = e^x$, $f_3(x) = xe^x$;

(e) $f_1(x) = \cos^2 x - \sin^2 x$, $f_2(x) = \sin^2 x$, $f_3(x) = 1$.

2. Find a particular solution of $y'' + 2y = 8x + 5$ by answering the following questions.

(a) Find a particular solution of $y'' + 2y = 1$ by inspection;

(b) Find a particular solution of $y'' + 2y = 4x$ by inspection;

(c) Use superposition principle to find a particular solution of $y'' + 2y = 8x + 5$.

3. Find a particular solution of $y'' - 3y' + 4y = 24x - 8$. (Hint: similar to question 2.)

4. Find the general solution of the given higher-order differential equation or solve the following IVP:

(a) $y''' - 4y'' - 5y' = 0$;

(b) $\frac{d^2y}{dx^2} - 36y = 0$;

(c) $4y'' - 4y' - 3y = 0$, $y(0) = 1$, $y'(0) = 5$;

(d) $y''' + 12y'' + 36y' = 0$, $y(0) = 0$, $y'(0) = 1$, $y''(0) = 7$.