Math 3120 Test # 3 Chapter 4

Name: Review Score: ……..

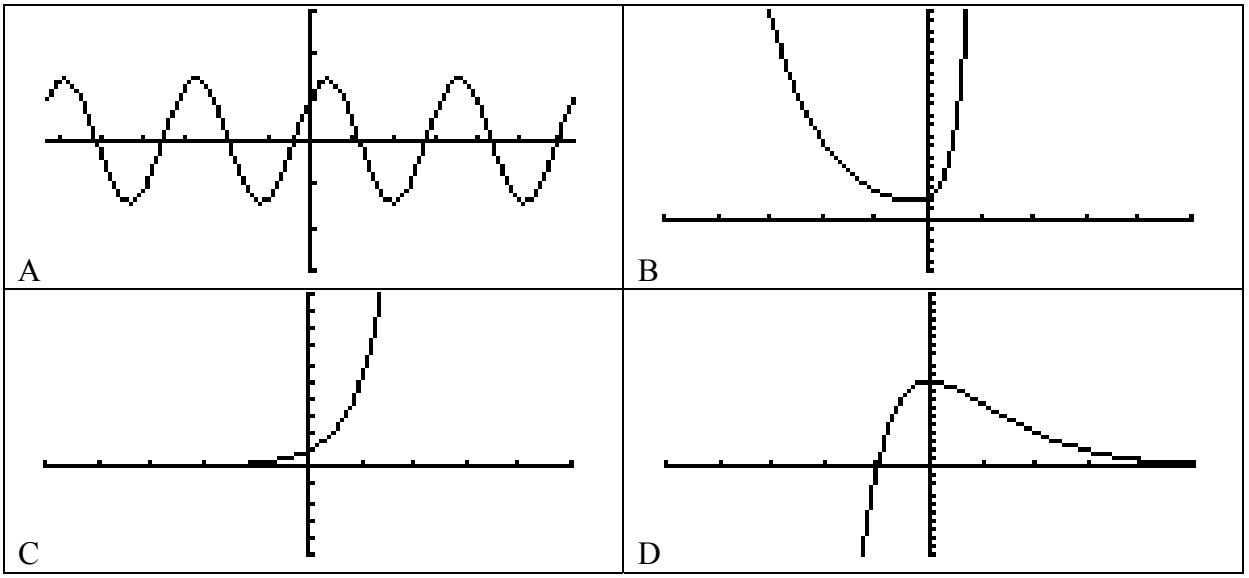
Show all steps in each problem for full credits.

1. Find an interval centered about x = 0 for which each initial – value problem has a unique solution.

a. $(x-2)y''+3y=x,\ y(0)=0,\quad y'(0)=1$ b. $y''+(\tan x)y=e^{x}, y(0)=1,\ y'(0)=0$

2. Verify that the functions $f(x)=e^{-3x}$ and $g(x)=e^{4x}$ form a fundamental set of solutions of the differential equation $y''-y'-12y=0$ on the interval $(-\infty,\infty)$.

3. Match a particular solution of each differential equation with its graph.
   a. $y''-3y-4y=0$ b. $y''+4y=0$ c. $y''+2y'+y=0$ d. $y''-3y'+2y=0$



4. a. Verify that the differential operator $L = D^2 + 64$ annihilates the function $f(x) = 2\cos 8x - 5\sin 8x$.

b. Let $f(x) = e^{-x} + 2xe^{x} - x^2e^{x}$, find a linear differential operator that annihilates *f(x).*

c. Find linearly independent functions that are annihilated by the operator $(D-6)(2D+3)$.

5. Solve the given DE by the method of variation of parameters.

$$y''+3y'+2y=\frac{1}{1+e^{x}}$$

6. Given the Cauchy – Euler equation $x^2y''+10xy'+8y=x^2$, do the following.

a. Find the complementary solution of the DE.

b. Use the substitution $x=e^t$ to transform the Cauchy – Euler equation to a DE with constant coefficients.

c. Find the general solution of the new DE in part ( b) using the method of undetermined coefficients.