

DIRECTIONS:

- **STAPLE** this page to the front of your homework (don't forget your name!).
- Show all work, clearly and in order **You will lose points if you work is not in order.**
- When required, **do not forget the units!**
- Circle your final answers. **You will lose points if you do not circle your answers.**

Question	Points	Score
1	2	
2	2	
3	1	
4	1	
5	2	
6	2	
Total	10	

Problem 1: (2 points) Solve the following equation using the method of undetermined coefficients.

$$y^{(4)} - 2y''' + y'' = e^x + 1.$$

(Hint: think about factoring differential operators.)

Problem 2: (2 points) Solve the following equation using variation of parameters.

$$y''' - 2y'' - y' + 2y = e^{3x}.$$

Problem 3: (1 point) Knowing that

$$e^x = \sum_{k=0}^{\infty} \frac{x^k}{k!},$$

$$\cos x = \sum_{k=0}^{\infty} \frac{(-1)^k}{(2k)!} x^{2k},$$

find the first four terms of a power series in x for $e^x \cos x$. (Hint: what do you know about multiplying series?)

Problem 4: (1 point) Find both the radius and interval of convergence of the given power series

$$\sum_{k=0}^{\infty} k! 2^k x^k.$$

Problem 5: (2 points) Using power series, find the solution to

$$(1 - x)y' - y = 0.$$

Problem 6: (2 points) Using power series find the solution to the given differential equation (Hint: calculate up to at least a_8 for $y = \sum_{n=0}^{\infty} a_n x^n$).

$$y'' - xy = 0.$$