

Math 210: Differential Equations with Applications  
Pre-Course Assessment  
Professor Donnay

Name:

"Knowledge is what is left over after you have forgotten everything else."

Please answer the following questions which relate to material we will be covering in the course and which you might (or might not) have seen in other math classes. This will give me useful information about what you know as we start the course but will not be counted towards your grade. Do not review or look anything up. No calculators.

For each question, also circle the appropriate number 1 to 4 where

- 1 indicates you have not seen this topic before
- 2 indicates you have seen topic but did not understand it
- 3 indicates you have seen topic, understood it at one point but have forgotten it
- 4 indicates you have seen topic and remember how to do it

1. Consider the function  $f(x) = 7e^{-3x}$ .

(a) Make a rough sketch of  $f(x)$

(b) Calculate  $\frac{d}{dx}f(x)$ .

Circle: 1      2      3      4

2.  $\frac{d}{dx} 5x^3 \sin(2x) =$

Circle: 1      2      3      4

3.  $\int \frac{1}{x} dx =$

Circle: 1      2      3      4

4.  $\int e^x dx =$

Circle: 1      2      3      4

5.  $\int x^2 \sin(3x^3) dx =$

Circle: 1      2      3      4

Hand in this portion of the assessment. You may finish the remaining questions outside of class; return them at the start of next class.

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6. Graph the curve given by the parametric equations

$$\vec{r}(t) = (x(t) = \cos(t), y(t) = \sin(t)), t \in [0, \pi].$$

Circle: 1      2      3      4

7. Calculate the tangent vector to this curve at the point  $\vec{r}(t = \pi/2)$ .

Circle: 1      2      3      4

8. What is the Taylor Series for  $f(x) = \sin x$  (i.e. the infinite Taylor approximation based at  $x_0 = 0$ )?

Circle: 1      2      3      4

9. For the vector field given by the vector valued function  $\vec{V}(x, y) = (2x + 3y, x - 2y)$ , calculate the vector  $\vec{V}(2, 1)$  and then plot this vector.

Circle: 1      2      3      4

10. Let

$$A = \begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix} \text{ and } b = \begin{pmatrix} 2 \\ 3 \end{pmatrix}.$$

(a) Calculate the matrix multiplication  $Ab =$

(b) Calculate the determinant of  $A =$

Circle: 1      2      3      4

11. For the matrix

$$M = \begin{bmatrix} 3 & 0 \\ 5 & 2 \end{bmatrix}$$

(a) Calculate the eigenvalues of M.

(b) Find one eigenvector of M.

Circle: 1    2    3    4

12. Pretend you are a computer and read through the following mini program. Write down everything the computer will print out as it runs through the program

```
Let sum = 0
For i = 1 to 3
Let sum = sum + i
Print i, sum
Next i
End
```

Circle: 1    2    3    4