NAME: (print!) _____

E-Mail address: _____

MATH 244 (1-3), Dr. Z. , Practice Test for Dr. Z.'s Math 244(1-3), Fall 2016

No Calculators! No Cheatsheets!
Write the final answer to each problem in the space provided. Incorrect answers (even due to minor errors) can receive at most one half partial credit, so please check and double-check your answers.

Do not write below this line (office use only)

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1.   (out of 10)

2.   (out of 10)

3.   (out of 10)

4.   (out of 10)

5.   (out of 10)

6.   (out of 10)

7.   (out of 10)

8.   (out of 10)

9.   (out of 10)

10.   (out of 10)

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total: (out of 100)

1. (10 pts.) Find the general solution to the following differential equation

$$y''(t) + 100\, y(t) = 0 \quad .$$

Ans.: $y(t) =$

2. (10 pts.) Find the Wronskian, $W(f(t), g(t))$ of the following pair of functions:

$$f(t) = e^{3t} \quad , \quad g(t) = te^{3t} \quad .$$

Ans.: $W(f(t), g(t)) =$

3. (10 pts.) Solve the initial value problem

$$y''(t) - 3\,y'(t) = 0 \quad , \quad y(0) = 2 \quad , \quad y'(0) = 3 \quad .$$

Ans.: $y(t) =$

4. (10 pts.) Use the **Euler method** to find an approximate value for $y(1.2)$ if $y(x)$ is the solution of the initial value problem differential equation

$$y' = x + y \quad , \quad y(1) = 0 \quad ,$$

using mesh-size $h = 0.1$.
Reminder: $x_n = x_0 + nh$, $y_n = y_{n-1} + hf(x_{n-1}, y_{n-1})$.

Ans.: $y(1.2)$ is approximately equal to:

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5. (10 pts.) For the following first-order differential equation, decide whether or not it is exact. If it is, solve it. Leave the answer in **implicit format**.

$$(3x^2 + y) + (x + 2y) \, y' = 0$$

Ans.:

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6. (10 pts.) For the following diff. eq. determine the critical (equilibrium) solutions and decide, for each such solution, whether it is asymptotically stable, unstable, or semi-stable.

$$\frac{dy}{dt} = y^2 - 3y \quad .$$

Ans.:

7. (10 pts.) Find the maximal open interval for which the following first-order diff.eq. inital value problem is guaranteed to have a unique solution. **Explain!**

$$(t-3)(t+4)\, y'(t) + e^t\, y(t) = t^2 \quad , \quad y(-1) = 10 \quad .$$

Ans.:

8. (10 pts.) Find an equation of the curve that passes through the point $(1, 2)$ and whose slope at (x, y) is x/y.

Ans.:

9. (10 pts.) Solve the initial value problem

$$y'(t) - 3\,y(t) = e^{2t} \quad , \quad y(0) = 1.$$

Ans.: $y(t) =$

10. (10 pts.) Decide whether $y(t) = te^{2t}$ is a solution of the initial value differential equation

$$y''(t) - 4\,y'(t) + 4\,y(t) = 0 \quad , \quad y(0) = 0 \quad , \quad y'(0) = 1 \quad .$$

Explain everything!