

Midterm Exam MATH 308

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Name: _____ UIN: _____

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I hereby certify that I have prepared my answers alone and without help by others:

(signature of student)

- Enter your name and UIN and sign the academic integrity statement above.
- Write your name on each page
- Read the whole exam first and start with the problems seeming most easy.
- Mark the problem you are solving clearly and comment shortly on the solution steps

Problem 1 (8 pts.): Which of the following functions does **not** have a Laplace transform for any s ? Circle!

$$d(t) = \arctan t$$

$$e(t) = \tan t$$

$$f(t) = \exp(t^2)$$

$$g(t) = \exp(1 + \ln t)$$

Problem 2 (10 pts.): Solve the initial value problem

$$y'' + 9y = t \quad y(0) = 0 \quad y'(0) = 1.$$

Problem 3 (12 pts.): Find a particular solution to

$$y'' + 6y' + 9y = e^{-3x}.$$

Problem 4 (10 pts.): Use variation of parameters to find a particular solution to

$$y'' + 6y' + 9y = e^{-3x}(1 - 6x).$$

Problem 5 (10 pts.): For a number $a > 0$, compute the Laplace transform of the function

$$f(t) = \begin{cases} 1/a & \text{if } t < a \\ 0 & \text{if } t \geq a. \end{cases}$$

What is the limit of this transform if $a \rightarrow 0$? (The second part may be difficult and is better left to the end)

Problem 6 (10 pts.): Compute the inverse Laplace transforms of

$$F(s) = \frac{s}{s^2 - 6s + 9}$$

$$G(s) = \frac{s}{s^2 - 6s + 13}$$