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| Test 2Dusty Wilson Math 125 – Spring 2009 No work = no credit **No Symbolic Calculators** | **Name**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *It is unworthy of excellent men to lose hours like slaves in the labor of calculation which could safely be relegated to anyone else if machines were used.*  Gottfried Wilhelm von Leibniz (1646 - 1716)  German mathematician |

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| Warm-ups (1 pt each) | = \_\_\_\_ | = \_\_\_\_ | = \_\_\_\_ |

(1 pt) Paraphrase the quote (see above) by Leibniz in the context of this calculator and computer age. Use complete sentences.

(3 pts) What three real and present day countries share a land border with Mexico?

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

#### \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(10 pts) A function  satisfies the differential equation .

1. What are the constant solutions of the equation?

1. For what value(s) of *y* is *y* increasing?
2. For what value(s) of *y* is *y* decreasing?
3. Classify the constant solutions from (a.) as stable or unstable solutions.

(10 pt) Evaluate the definite integral 

#### \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### (30 pts) Solve the differential equation that satisfies the initial condition

#### \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(10 pts) A tank is filled with 2000 L of brine with 30kg of dissolved salt. Pure water is pumped into the tank at a rate of 25 L/min. The solution is kept thoroughly mixed and drains from the tank at the same rate. How long until only 5kg of salt remains?

#### \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(10 pt) Find . (You do not need to simplify).

#### \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(15 pts) Suppose there are 7,000 students at Highline. Four of these students catch the highly contagious rabbit-flu and it begins to spread among the student population with a total of five students having it on the next class day. Initially, the number of cases grows at a rate proportional to the number of students that have the flu. But, officials anticipate that the number of cases diagnosed would decrease should more than 10% of the students catch the rabbit flu.

1. (5 pts) Set-up a differential equation to model the number of rabbit-flu cases after *t* days at Highline.

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1. (10 pts) Solve the differential equation from (a.). If you can’t answer (a.), I will give you the solution, but it will cost you 3 points.

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1. (2 pts) How many days until 100 students have the rabbit flu?

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