Solutions

Math 132, Exam 3

April 17, 2001

Part I of this exam should have 13 multiple choice questions and 5 True–False questions. Part II will have 2 hand graded questions. Please check to see that your exam is complete. If you do not have a number 2 pencil to mark your card, please request one from a proctor.

Write your Social security number on the nine blank lines at the top of your answer card, using one blank for each digit. **Shade in the corresponding boxes below.** Leave the boxes for version type blank.

As you work the exam, circle your answers on the exam sheet. When you are certain of your answers, fill in the boxes on the card, shading them heavily. If your card becomes damaged, ask a proctor for another one.

The multiple choice problems count for 5 points each, the True–False for 2 points each, giving a total of 75 points. The handgraded part counts for another 25 points.

IMPORTANT! Write your name and ID number on both of the handgraded sheets. These will be separated from the rest of the exam during the grading process and, if we can't identify you, you will get no credit for the question.

Part I

1. Solve

$$\frac{dv}{dt} = e^{v+2t}.$$

(Hint. Think separable equations.)

(A) $-\frac{1}{2}\ln^2(e^t + c)$ (B) $\frac{1}{2}e^{2t} + c$

(C) $\frac{1}{2t} + c$ (D) $\ln[e^{2t} + c]$

(E) $e^{\ln(2t+c)}$ (F) $\frac{1}{2}\ln^2(e^t) + c$

(G) $e^{2t}e^c$ (H) $e^{2t}(\ln 2t) + c$

(I) $-\ln[-\frac{1}{2}e^{2t} + c]$ (J) $-e^{2t}e^c$

$\frac{dv}{dt} = e^v e^{2t}$

$\int e^{-v}\,dv = \int e^{2t}\,dt$

$-e^{-v} = \frac{1}{2}e^{2t} + c$

$e^{-v} = -\frac{1}{2}e^{2t} + c$

$-v = \ln\left[-\frac{1}{2}e^{2t} + c\right]$

$v = -\ln\left[-\frac{1}{2}e^{2t} + c\right]$

2. A 100 gallon tank is filled with salt water containing 1 pound of salt per gallon. Pure water enters the tank at the rate of 1 gallon per minute, the water is thoroughly mixed and the resulting salt water leaves at the same rate of 1 gallon per minute. How many pounds of salt is in the tank after 1 hour?

(A) 22.1 (B) 34.5 (C) 39.7 (D) 42.4 (E) 54.8

(F) 61.1 (G) 62.4 (H) 73.5 (I) 89.9 (J) 90.0

Let $A(t)$ = amount of salt at time t

$$\frac{dA}{dt} = 0 - \frac{A}{100}\frac{\text{lbs}}{\text{gall}} \cdot \frac{1\text{ gall}}{1\text{ min}} = -\frac{A}{100}$$

$$\int \frac{1}{A}\,dA = \int -\frac{1}{100}\,dt$$

$$\ln A = -\frac{t}{100} + c$$

$$A = Ke^{-t/100}$$

$$A(0) = 100 = k$$

$$A(t) = 100e^{-t/100}$$

$$A(60) = 100e^{-.6} = 54.8 \text{ lbs}$$