

You may use one notesheet, prepared in advance, no larger than 8.5×11 inches in size. You are expected to have a scientific calculator, and you may use it. You may not use other notes, nor books.

Note: This is a sample (partial) test. It's purpose is to give you some indication of what the real test will, more or less, look like.

Problem 1. (20 points if correct, 0 points if wrong). Solve the initial value problem

$$\frac{dy}{dx} = x e^{x+y}, \quad y(0) = 0.$$

Choose the number closest to $y(0.5)$ below.

- A.) 0.2 B.) 0.193147
C.) 0 D.) 0.217348 E.) 0.190123

←Letter corresponding to your answer to problem 1.

Problem 2. (20 points if correct, 0 points if wrong). Solve the initial value problem

$$x \frac{dy}{dx} = \frac{y}{x} - y, \quad y(1) = 4.$$

Then compute $y(2)$.

- A.) \sqrt{e} B.) $2\sqrt{e}$
C.) $3\sqrt{e}$ D.) $4\sqrt{e}$ E.) None of the foregoing.

←Letter corresponding to your answer to problem 2.

Problem 3. (20 points if correct, 0 points if wrong). A very large tank contains 40 L brine of concentration 2 g/L salt. Brine of concentration 1 g/L salt flows into the tank at 3 L/min and the well-mixed solution is pumped out at 1 L/min. Assuming that the tank does not overflow what is the concentration of salt in the brine in the tank after 10 min? (Choose the closest value.)

- A.) 1.25523 g/L B.) 1.37894 g/L
C.) 1.54433 g/L D.) 1.59921 g/L E.) 1.77824 g/L

←Letter corresponding to your answer to problem 3.

Problem 4. (20 points if correct, 0 points if wrong). Given the initial value problem

$$\frac{dy}{dx} = \cos(x^2 + y), \quad y(1) = 2$$

estimate $y(2)$ by using Euler's method with step size 0.2 (so 5 steps). Choose the closest value.

- A.) 1.2499 B.) 1.3123
C.) 1.4153 D.) 1.4221 E.) 1.4332

←Letter corresponding to your answer to problem 4.
