Quiz 1

Graded

Student

Mouhammad Dia

Total Points

7 / 9 pts

Question 1

Integrating Factor

3 / 3 pts

Growing (1/3)

- **+ 1 pt** Serious integration error/failure to evaluate integrals
- **+ 1 pt** missing constant of integration in final answer
- **+ 1 pt** wrong setup for integrating factor
- **+ 1 pt** wrong setup for ODE with integrating factor (wrong understanding)
- **+ 1 pt** wrong eqn due to transcription error
- **+ 1 pt** absence of constant in integration (wrong occurance)
- **+ 1 pt** forgot to substitute back the changed variable
- **+ 1 pt** failed to simplify exp(ln(x)), failed to calculate later integration involving it, wrong solution
- **+ 0 pts** transcription error for ODE, no later solution after geting integration factor
- **+ 1 pt** wrong ode to get format y'+p y =q due to some error

---

Revise (2/3)

- **+ 2 pts** Transcription error
- **+ 2 pts** Missing required absolute value in answer
- **+ 2 pts** other error
- **+ 2 pts** wrong about integrating of cos(x)
- **+ 2 pts** middle step correct, but wrong solution to get y, c is wrongly defined (missing by divided by \mu)
- **+ 3 pts** got correct answer for y, somehow tried to solve for constant c with wrong constraint?
- **+ 2 pts** middle step correct, wrong answer to y
- **+ 2 pts** got correct answer for y, wrong constraint for c,wrong understanding for c, c is a constant real number
- **+ 2 pts** correct integration factor, wrong ODE possibly due to transcription error
- **+ 2 pts** absent steps for integrating factor although final correct answer
- **+ 2 pts** correct answer in steps, wrong answer in answer box
- **+ 3 pts** no steps for calculation of integration for \mu, but correct answer
- **+ 2 pts** wrong integration factor, possibly due to typo?
- **+ 2 pts** wrong integration factor due to forgot exponential
- **+ 2 pts** error in integration factor when substitute changed variable back

---

- **+ 3 pts** Proficient: fully correct
- **+ 3 pts** left side as derivatice of (uy), no mention of x>1 for ln(x)

Not yet (0/3)

+ 0 pts blank

+ 0 pts Some work is shown but no indication of understanding

---

+ 3 pts didn't mention |ln(x)| when doing integration

✔ **+ 3 pts** removed absolute value sign for |lnx|, but no given explicit reason

---

related with removing absolute value sign

+ 3 pts correct with geting absolute value, but get messy to remove it, and actually something wrong when calculate integration with absolute value

+ 3 pts keeping ln|x|, then disappear, no reason

+ 3 pts absent and then occurance of absolute value sign, then messy with ln|x|

+ 3 pts keep in ln|x|

+ 3 pts didn't show |lnx| but mentioned x>1

+ 3 pts keep |lnx|

+ 0 pts don't have explicit constant, but there is integration in final answer

+ 1 pt successful revision

+ 0 pts Unsuccessful revision attempt

---

revision

+ 0 pts no original work with the highlighted error in revision

+ 0 pts no reflection

+ 0 pts didn't consider about absolute value for integral of 1/u

+ 0 pts skip details for integral although showed in original solution

+ 0 pts no explicit reason for removing absolute value

+ 0 pts corrected solution only contains the part since error

+ 0 pts no originl work with highlighted error, but listed the error eqn in original work

+ 0 pts corrected solution only contains the part since error (although directly below or next to the original work)

Question 2

Separable

3 / 3 pts

Growing (1/3)

- **+ 1 pt** Did not include a constant of integration
- **+ 1 pt** Conceptual Integration error

Revise (2/3)

- **+ 2 pts** Algebra error
- **+ 2 pts** Correct except answer incorrectly excludes negative solutions
- **+ 2 pts** Very minor integration error

- ✔ **+ 3 pts** Proficient: entirely correct

Not yet (0/3)

- **+ 0 pts** blank
- **+ 0 pts** Some work shown, but no indication of understanding

---

- **+ 1 pt** Successful revision
- **+ 0 pts** Unsuccessful revision

Question 3

Directional Fields

1 / 3 pts

Growing (1/3)

+ 1 pt Incorrect answer, explanation, or justification for answer to part iii

+ 1 pt Solution drawn incorrectly, with tangent lines clearly crossing or incorrect behavior in certain regions of t

✔ **+ 1 pt** Initial condition not satisfied

+ 1 pt No solution to IVP sketched

+ 1 pt Incorrect slope field selected for part (i)

Revise (2/3)

+ 2 pts Solution graph does not cover entire interval (correctly shown only for $t \geq 0$).

+ 2 pts All correct, but no reasoning/justification provided for choice of slope field, or part (iii) box left blank without an explicit response.

+ 3 pts Proficient: fully correct

Not yet (0/3)

+ 0 pts blank

+ 0 pts some work shown, but no indication of understanding

+ 0 pts Click here to replace this description.

+ 1 pt Successful revision

+ 0 pts Unsuccessful revision attempt

MATH 2930

Quiz 1

Version A

Name: Mahammad Dia

Student ID#: 5620240

Fall 2025

INSTRUCTIONS — PLEASE READ THIS NOW

- **Write your full name and 7 digit student ID #** in the spaces provided **right now**.
- **Show your work.** To receive full credit, your answers must be neatly written and logically organized. Complete justifications and explanations are expected.
- **Each problem is related to one Learning Outcome.** The outcomes are not directly labeled.
- **Write your answers in the space provided.** If your answers are not written in the space provided, they may not be seen by the graders.
- **You have 50 minutes to complete this quiz.** You may leave early, but if you finish within the last 10 minutes, please remain in your seat.
- **This is a closed book exam.** No notes, books, or electronic aids are allowed.
- **Academic integrity** is expected of all Cornell University students at all times, whether in the presence or absence of members of the faculty. Understanding this, I declare I shall not give, use, or receive unauthorized aid in this examination.

Please sign below to indicate that you have read and agree to these instructions.

Signature of Student

$\int \frac{dx}{x\ln x} \rightarrow \frac{1}{u}du$

1. Find the *explicit* general solution $y(x)$ of the differential equation if possible, otherwise find the implicit general solution:

$$\ln(x)\frac{dy}{dx} = \cos x - \frac{y}{x}, \quad x > 1$$

$\rightarrow \ln(x)\frac{dy}{dx} + \frac{y}{x} = \cos x$

$\rightarrow \frac{dy}{dx} + \frac{1}{x\ln(x)}y = \frac{\cos x}{\ln(x)}$

$\rightarrow \mu(x) = e^{\int \frac{1}{x\ln(x)}dx}$ $u = \ln x$, $du = \frac{1}{x}dx$ $= e^{\int \frac{1}{u}du}$

$= e^{\ln|u|} = e^{\ln|\ln x|} = \ln x$

$\rightarrow \frac{d}{dx}(y\ln x) = \int \cos x\,dx + C$

$y\ln x = \sin x + C$

$$y = \frac{\sin x + C}{\ln x}$$

$y(x)$: $\frac{\sin x + C}{\ln x}$

$uv - \int v\,du$

2. Find the general solution to the given differential equation. If it's possible to solve for $y(x)$ explicitly, do so. If not, you may leave an implicit function definition.

$$y\ln(y)\frac{dy}{dx} - 1 = 2x\cos(x^2), \qquad y > 0$$

$\int 2x\cos(x^2)\,dx$ $\begin{matrix} u = x^2 \\ du = 2x\,dx \end{matrix}$

$\to \int \cos u\,du = \sin u$

$\to \sin(x^2)$

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

$\int y\ln y\,dy = \int (2x\cos(x^2))\,dx + \int dx$

$\frac{1}{2}y^2\ln y - \frac{1}{4}y^2 = \sin(x^2) + x + C$

$y^2\left(\frac{1}{2}\ln y - \frac{1}{4}\right) = \sin(x^2) + x + C$

$y^2 = \frac{\sin(x^2) + x + C}{\frac{1}{2}\ln y - \frac{1}{4}} = \frac{4\sin(x^2) + 4x + 4C}{2\ln y - 1}$

$\to \int y\ln y\,dy$ $\begin{matrix} u = \ln y \\ du = \frac{1}{y}dy \\ dv = y \\ v = \frac{y^2}{2} \end{matrix}$

$\to \frac{y^2\ln y}{2} - \int \frac{y^2}{2}\cdot\frac{1}{y}\,dy$

$= \frac{y^2\ln y}{2} - \frac{1}{2}\int y\,dy$

$= \frac{y^2\ln y}{2} - \frac{y^2}{4}$

$$\boxed{y = 2\sqrt{\frac{4\sin(x^2) + x + C}{2\ln y - 1}}}$$

$y(x)$:

$$y = 2\sqrt{\frac{\sin(x^2) + x + C}{2\ln y - 1}}$$

3. For the differential equation shown here, **address all the prompts below.**

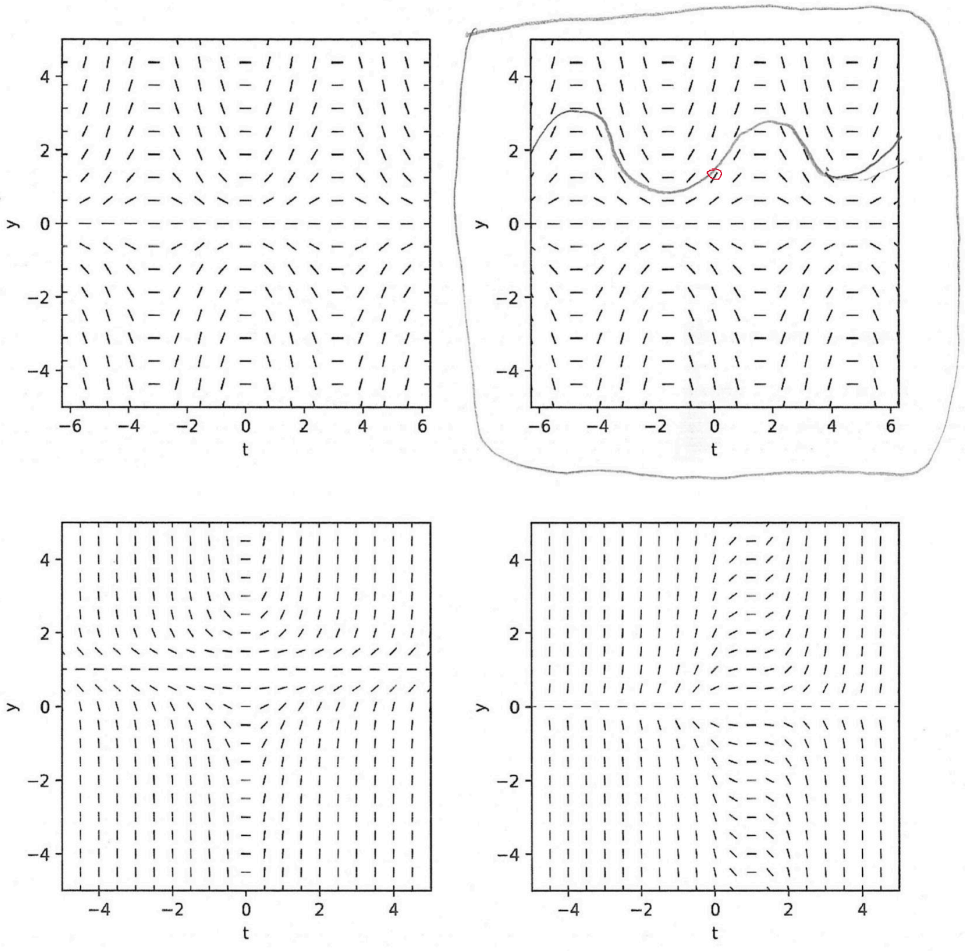
$$\frac{dy}{dt} = y \cos t,$$

i Select which of the four slope fields below corresponds to the differential equation and briefly explain/justify your choice.

ii Sketch the graph of the solution that satisfies the initial value problem $y(0) = 2$ in the respective diagram. You do not need to provide a formula for the solution. As usual, the horizontal coordinate is t and the vertical is y.

iii Are there any finite values of t or y for which the slope is infinite? If so, list them.

i) The option I selected is the only one where the slope is 0 when cos(t) is 0



Conditions for infinite slope (if any):

None