Homework 02: PAR Challenge Problem

Initial Solution: Due Thursday 1/29
Final Solution: Due Friday 1/30

Student Name: ____________________________
Workgroup Instructor: ______________________

Instructions:
1. Complete your initial solution (working individually or with peers) in the space provided.
2. Complete a self-reflection (working individually) of the work that you (or your group) did.
3. On Thursday, you will trade your work with a peer. Silently, read through your partner’s work and fill out the peer-feedback form (in their packet); afterwards, you will discuss briefly with your partner.
4. On Friday, turn in your “PAR packet”: (1) original solution, (2) self-reflection form, (3) PAR form (filled out by your partner), and (4) revised solution based on feedback you received. In order to receive full credit you must turn in all 4 items in this packet, but you will only be graded for the correctness of your final solution. Complete all work on the paper provided.

NOTE: Your partner must write his/her name on the peer-feedback page in order for you to receive credit for the peer feedback. (So make sure he/she writes it!)

Problem Statement: Polynomial Power

Your task is to find a second-degree polynomial \( P(x) \) such that \( P(0) = 1 \), \( P'(0) = 0 \), and \( \int \frac{P(x)}{x^3(x-1)^2} \, dx \) is a rational function.

1. Since \( P(x) \) is a second-degree polynomial, it can be written in the general form of \( P(x) = ax^2 + bx + c \), where \( a, b, \) and \( c \) are unknown parameters. Use the initial conditions for \( P(0) \) and \( P'(0) \) to solve for as many of these parameters as possible.
2. Using the \( P(x) \) you found above, evaluate the resulting integral. You may leave your results in terms of whatever functions result from integration (i.e., \( P(x) \) need not be written as a rational function).
3. Choose appropriate values for the remaining parameters in \( P(x) \) to make the integral given in the problem statement evaluate to a rational function.
4. Suppose that the term \( (x-1)^2 \) were changed to \( (x-1)^5 \). How would this change the problem? Could you still find a solution?
5. Now, instead suppose that the initial conditions on \( P(0) \) and \( P'(0) \) were removed from the problem. How would this change the problem? Could you still find a solution?
6. Now, instead suppose that \( P(x) \) was another type of function, such as \( e^x \), \( \ln(x) \), or \( \sin(x) \). How would this change the problem? Could you still find a solution?
Initial Solution Continued (Hwk02 PAR Problem)
Self-Reflection (to be filled out by you)

Hwk02 PAR Problem

Instructions: After completing your initial solution, complete this self-reflection.

Completeness, Organization, and Labeling
Did you answer all questions asked, showing all steps, in the proper order? yes ___ no ___
(As appropriate) Did you label and explain all graphs, include units, etc.? yes ___ no ___

Explanations
Did you explain why (not just what)? yes ___ no ___

Use of Language
Did you avoid the use of pronouns (and other ambiguous language)? yes ___ no ___
(As appropriate) Did you use terms according to their mathematical definitions? yes ___ no ___

Diagrams
Did you draw a diagram to support your explanations? yes ___ no ___

(Optional:) Is there anything in particular you’d like to discuss with your partner?
Peer Feedback Form (to be filled out by a partner)

Hwk02 PAR Problem

Instructions: On Thursday in class, trade your solution with a classmate you didn’t work with to receive peer feedback.

Communication: Give at least one suggestion to improve the communication of the solution. (Focus on explanations, imprecise use of language, organization, labeling, etc. Be specific: don’t say “it was hard to follow” or “part 2 was unclear;” say why it was hard to follow, what was unclear, and how to improve it.)

Correctness: Note any errors you found. (Focus on misunderstanding of concepts, misuse of mathematical language, calculational errors, incomplete answers, etc. Be specific: don’t just say “part 2 is was wrong;” say exactly what is wrong, why it is wrong, and how to improve it.)

(Optional:) What other feedback do you have? How else could the solution be improved?