Instructions for Solving the DPP (Daily Practice Problems)

1. Purpose of the DPP

- This DPP is designed to strengthen concept clarity for both **JEE Main** and **JEE Advanced**.
- Problems are arranged in increasing order of difficulty:
  - **Level–1**: JEE Main oriented
  - **Level–2**: Mixed Main + Advanced
  - **Level–3**: JEE Advanced oriented

2. How to Attempt the DPP

1. Read the theory from your notes before attempting the problems.
2. Do not jump between questions; solve sequentially unless instructed otherwise.
3. For each question, write:
   - Key concept involved
   - Formula used
   - Corrected approach if you made an error
4. Maintain a separate **DPP Mistake Notebook**.

3. Recommended Time Allocation

- Total time per DPP: **45–60 minutes**.
- Follow the recommended per-question time:
  - Single Correct / Objective: **1–2 minutes**
  - Numerical Value: **2–3 minutes**
  - Integer Type: **3–4 minutes**
  - Advanced Multi-Correct: **4–6 minutes**
  - Paragraph (Advanced): **6–8 minutes**
- Mark questions exceeding time limit with a star (*) and revisit after finishing the DPP.

4. Best Practices for Scoring Higher

- Focus on accuracy first, then speed.
- Review every calculation step—most mistakes arise from small algebraic slips.
- Solve advanced problems only after finishing Main-level questions for the chapter.
- Revise solved DPPs weekly and note repeating mistake patterns.
- Use short notes for formulas, special results, and commonly used approximations.
- After solving, compare your approach with the official solution or teacher's method.
- Build endurance by solving at least one DPP in exam-like conditions daily.

5. Evaluation Guidelines

- Award yourself:
  - **+4 / -1** for JEE Main pattern questions.
  - **Partial marking** for JEE Advanced style multi-correct.
- Maintain a cumulative score record for every DPP set.
- Track:
  - Chapters with highest accuracy
  - Chapters needing revision
  - Time taken per DPP
  - Common error types

6. Weekly Review Checklist

- Reattempt the unsolved or incorrect problems from the past 5–7 DPPs.
- Update your formula sheet and mistake notebook.
- Solve at least one mixed-topic DPP to test retention.

By: www.udgamwelfarefoundation.com (helping students since 2012)

Set 1 - Limits and Continuity

Subjective Questions

1. If
$$f(x) = \begin{cases} \frac{e^{\frac{1}{(x-1)}}-2}{e^{\frac{1}{(x-1)}}+2}, & \text{if } x \neq 1 \\ 1, & \text{if } x = 1 \end{cases}$$
Discuss the behavior of $f(x)$ at $x = 1$.

2. Evaluate $\lim_{x\to 0} \frac{x\cos x - \sin x}{x^2 \sin x}$

3. Let
$$f(x) = \begin{cases} \frac{1-\cos 4x}{x^2}, & \text{if } x < 0 \\ a, & \text{if } x = 0 \\ \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}-4}, & \text{if } x > 0 \end{cases}$$
Find the value of a so that the function may be continuous at $x = 0$.

4. Evaluate the values of a, b and c such that $\lim_{x\to 0} \frac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2$.

5. Find the value of $f(0)$ so that the function $f(x) = \frac{1}{x} - \frac{2}{e^{2x}-1}, x \neq 0$ is continuous at $x = 0$.

Multiple Choice Questions

6. The function $f(x) = |x| + \frac{|x|}{x}$ is:
   (a) discontinuous at the origin because $|x|$ is discontinuous there
   (b) discontinuous at the origin because $\frac{|x|}{x}$ is discontinuous there
   (c) discontinuous at -1 because $\frac{|x|}{x}$ is discontinuous there
   (d) continuous at the origin

7. $\lim_{x\to\infty} \left(\frac{x+1}{x+2}\right)^{2x+1}$ is:
   (a) e^{-2}
   (b) e
   (c) e^{-3}
   (d) e^2

8. The value of $\lim_{n\to\infty} \left(\frac{1}{1\cdot 3} + \frac{1}{3\cdot 5} + \cdots + \text{up to n terms}\right)$ is:
   (a) $\frac{-1}{2}$
   (b) 0
   (c) $\frac{1}{2}$
   (d) $\frac{1}{3}$

9. If $\lim_{x\to 0}(1+ax)^{\frac{b}{x}} = e^4$ where a and b are natural numbers then:

(a) $ab = 4$

(b) $ab = 6$

(c) $ab = 8$

(d) $ab = 14$

10. $\lim_{x\to 0} \frac{a^x - 1}{\sqrt{a+x} - \sqrt{a}}$ is:

(a) $2\sqrt{a} \cdot 2 \log a$

(b) $2\sqrt{3a} \log a$

(c) $2\sqrt{a} \log a$

(d) $\sqrt{a} \log a$

11. The function $f(x) = [x] \cos\left[\frac{2x-1}{2}\right] \pi$ where [.] denotes the greatest integer function is discontinuous at:

(a) all x

(b) no x

(c) all integral points

(d) x which is not an integer

12. $\lim_{n\to\infty} \sin[\pi\sqrt{n^2+1}]$ is equal to:

(a) ∞

(b) 0

(c) does not exist

(d) -1

13. The function defined by

$$f(x) = \begin{cases} |x-3|, & \text{if } x \geq 1 \\ \frac{1}{4}x^2 - \frac{3}{2}x + \frac{13}{4}, & \text{if } x < 1 \end{cases}$$

(a) continuous at $x = 1$

(b) continuous at $x = 3$

(c) differentiable at $x = 1$

(d) all of the above

14. If

$$f(x) = \begin{cases} e^x, & \text{if } x \leq 0 \\ |1-x|, & \text{if } x > 0 \end{cases}$$

(a) $f(x)$ is differentiable at $x = 0$

(b) $f(x)$ is continuous at $x = 0, 1$

(c) $f(x)$ is differentiable at $x = 1$

(d) none of the above