

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**.
- 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.

4. Best Practices for Scoring Higher

- Focus on accuracy first, then speed.
- Review every calculation step.
- Solve advanced problems only after covering all Main-level problems.
- Revise solved DPPs weekly and track repeating mistake patterns.
- Use short notes for formulas and important approximations.
- Compare your approach with the official or teacher's solution.
- Build endurance by solving at least one DPP in exam-like conditions daily.

5. Evaluation Guidelines

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

6. Weekly Review Checklist

- Reattempt incorrect/unsolved questions from last 5–7 DPPs.
- Update formula sheet and mistake notebook.
- Solve a mixed-topic DPP to test retention.

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

Set 4 - Limits and Continuity

Subjective Questions

1. ABC is an isosceles triangle inscribed in a circle of radius r . If $AB = AC$ and h is the altitude from A to BC , then the triangle ABC has perimeter

$$P = 2(\sqrt{2hr - h^2} + \sqrt{2hr})$$

and area $A = \dots$ Also find

$$\lim_{h \rightarrow 0} \frac{A}{P^3}.$$

2. Evaluate

$$\lim_{x \rightarrow -\infty} \left(\frac{x^4 \sin(1/x) + x^2}{1 + |x|^3} \right)$$

3. Evaluate

$$\lim_{x \rightarrow 0} \frac{\int_0^{x^2} \cos^2 t \, dt}{x \sin x}$$

4. Evaluate

$$\lim_{h \rightarrow 0} \frac{\ln(1 + 2h) - 2 \ln(1 + h)}{h^2}$$

5. Evaluate

$$\lim_{x \rightarrow \infty} \left(\frac{x + 6}{x + 1} \right)^{x+4}$$

6. Evaluate

$$\lim_{x \rightarrow 0} \left(\frac{1 + 5x^2}{1 + 3x^2} \right)^{1/x^2}$$

Multiple Choice Questions

1. The integer n for which

$$\lim_{x \rightarrow 0} \frac{(\cos x - 1)(\cos x - e^x)}{x^n}$$

is finite and non-zero is:

- (a) 1
- (b) 2
- (c) 3
- (d) 4

2. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ with $f(1) = 3$ and $f'(1) = 6$. Then

$$\lim_{x \rightarrow 0} \left(\frac{f(1+x)}{f(1)} \right)^{1/x}$$

equals:

- (a) 1
- (b) $e^{1/2}$
- (c) e^2
- (d) e^3

3. If

$$\lim_{x \rightarrow 0} \frac{((a-n)x - \tan x) \sin(nx)}{x^2} = 0,$$

where n is non-zero, then $a =$

- (a) 0
- (b) $\frac{n+1}{n}$
- (c) n
- (d) $n + \frac{1}{n}$

4. For $x > 0$,

$$\lim_{x \rightarrow 0} \left((\sin x)^{1/x} + (1/x)^{\sin x} \right)$$

equals:

- (a) 0
- (b) -1
- (c) 1
- (d) 2

5. Evaluate

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{\int_2^{\sec^2 x} f(t) dt}{x^2 - \frac{\pi^2}{16}}$$

- (a) $\frac{8}{\pi} f(2)$
- (b) $\frac{2}{\pi} f(2)$
- (c) $\frac{2}{\pi} f(1/2)$
- (d) $4f(2)$

6. Let

$$f(x) = \begin{cases} \frac{e^{2x} - e^{-2x} - 4x}{x^3 \sin x}, & x \neq 0 \\ k, & x = 0 \end{cases}$$

Find k for continuity:

- (a) $\frac{4}{3}$
- (b) $\frac{8}{3}$
- (c) $\frac{16}{3}$
- (d) $\frac{32}{3}$

7. Evaluate

$$\lim_{x \rightarrow 0} \frac{x(e^x - 1) - \sin^2 x}{x^3}$$

- (a) $\frac{1}{2}$
- (b) $\frac{1}{3}$
- (c) $\frac{1}{6}$
- (d) $\frac{1}{12}$

8. Given

$$f(x) = \begin{cases} \frac{\tan((a+1)x) - \tan x}{x}, & x < 0 \\ p, & x = 0 \\ \frac{\sqrt{x+bx^3} - \sqrt{x}}{x^{5/2}}, & x > 0 \end{cases}$$

For continuity at 0, the correct set is:

- (a) $a = 1, b = 2, p = 1$
- (b) $a = 2, b = 1, p = 2$
- (c) $a = 0, b = 1, p = 1$
- (d) $a = 1, b = 0, p = 2$

9. Evaluate

$$\lim_{x \rightarrow 0} \frac{(1+x)^{1/x} - e + \frac{ex}{2}}{x^2}$$

- (a) $\frac{11e}{24}$
- (b) $\frac{13e}{24}$
- (c) $\frac{17e}{24}$
- (d) $\frac{19e}{24}$