



**Test Papers
Hub.**

AP Calculus BC Practice Paper 1

Full Practice Examination

45 multiple-choice (A–D) · 6 free-response questions (54 marks) · 3 hours 15 minutes · 99 marks in all

How to use this booklet

- Section I: 45 multiple-choice questions (Part A: 30 questions, 60 minutes, no calculator; Part B: 15 questions, 45 minutes, graphing calculator). Section II: 6 free-response questions of 9 marks each (Part A: 2 questions, 30 minutes, calculator; Part B: 4 questions, 60 minutes, no calculator).
- Show all work for Section II; a correct answer with no supporting work may not receive full credit. This is an original TPH practice paper written to the College Board course description; it is not a College Board publication.
- Worked solutions follow the paper: every question has step-by-step working and a key takeaway.

SECTION I, PART A — NO CALCULATOR

30 questions · 60 minutes

Choose the best answer for each question. A calculator may not be used in this part.

1. Which of the following series converges?

A $\sum (n = 1 \text{ to } \infty) \frac{1}{n}$

B $\sum (n = 0 \text{ to } \infty) \left(\frac{3}{2}\right)^n$

C $\sum (n = 2 \text{ to } \infty) \frac{1}{n \ln n}$

D $\sum (n = 1 \text{ to } \infty) 1/n^{(\frac{3}{2})}$

2. The value of $\int \text{from } 0 \text{ to } 1 \text{ of } x \cdot e^x \, dx$ is

A -1

B 2

C 1

D 0

3. A particle moves along the x-axis with velocity $v(t) = t^2 - 7t + 6$ for $t \geq 0$. The particle is moving to the left when

A $t > 6$

B $1 < t < 6$

C $2 < t < 7$

D $t < 1$

4. For the polar curve $r = 4 + 1 \cos \theta$, the value of dy/dx at $\theta = \frac{\pi}{2}$ is

A 4

B $-\frac{1}{4}$

C -4

D $\frac{1}{4}$

5. $\int \text{from } 0 \text{ to } 1 \text{ of } 6e^{(4x)} \, dx =$

A $-6 + 6e^4$

B $-3 + 3e^4$

C $-\frac{1}{2} + 3e^{4/2}$

D $-\frac{3}{2} + 3e^{4/2}$

6. The value of $\int_7^{\infty} dx/x^4$ is

- A $\frac{1}{2401}$
- B $\frac{1}{1029}$
- C $\frac{1}{343}$
- D ∞

7. The number of critical points of $f(x) = x^3 - 4x$ is

- A 2
- B 1
- C 4
- D 3

8. A population $P(t)$ satisfies the logistic differential equation $dP/dt = 0.1 \cdot P(1 - P/60)$, with $P(0) = 6$. The population is growing fastest when P equals

- A 15
- B 60
- C 6
- D 30

9. If $f(x) = x^2 + \sin(2x)$, then $f''(\frac{\pi}{2}) =$

- A 2
- B 4
- C $-2 + \pi$
- D -2

10. The gradient of the curve $1x^2 + 2y^2 + xy = 11$ at the point (1, 2) is

- A $\frac{4}{9}$
- B -0.2500000000000000
- C $\frac{9}{4}$
- D $-\frac{4}{9}$

WORKED SOLUTIONS

Answers & worked solutions

Multiple-choice answer key

1	D	2	C	3	B	4	D	5	D	6	B
7	A	8	D	9	A	10	D	11	C	12	A
13	A	14	D	15	C	16	D	17	C	18	A
19	B	20	B	21	D	22	C	23	C	24	A
25	B	26	C	27	C	28	A	29	A	30	B
31	C	32	B	33	B	34	C	35	A	36	D
37	D	38	B	39	B	40	A	41	A	42	B
43	C	44	A	45	D						

SECTION I, PART A — NO CALCULATOR

1. Which of the following series converges? [Convergence tests]

Correct answer: D — $\sum (n = 1 \text{ to } \infty) 1/n^{(\frac{3}{2})}$

- Test each series: p-series $\sum 1/n^p$ converges only when $p > 1$; geometric series $\sum r^n$ converges only when $|r| < 1$.
- Only $\sum (n = 1 \text{ to } \infty) 1/n^{(\frac{3}{2})}$ converges.
- $\sum (n = 0 \text{ to } \infty) (\frac{3}{2})^n$: a geometric series with ratio $\frac{3}{2} > 1$ diverges.
- $\sum (n = 2 \text{ to } \infty) \frac{1}{n \ln n}$: the integral test with $\int dx/(x \ln x) = \ln(\ln x)$ shows this diverges.
- $\sum (n = 1 \text{ to } \infty) \frac{1}{n}$: the harmonic series is a p-series with $p = 1$, so it diverges.
- Why the other options are wrong:
 - A ($\sum (n = 1 \text{ to } \infty) \frac{1}{n}$): The harmonic series is a p-series with $p = 1$, so it diverges
 - B ($\sum (n = 0 \text{ to } \infty) (\frac{3}{2})^n$): A geometric series with ratio $\frac{3}{2} > 1$ diverges
 - C ($\sum (n = 2 \text{ to } \infty) \frac{1}{n \ln n}$): The integral test with $\int dx/(x \ln x) = \ln(\ln x)$ shows this diverges

LOS: Unit 10: Infinite sequences and series

KEY TAKEAWAY

p-series converge for $p > 1$ and geometric series for $|r| < 1$; the nth-term test kills any series whose terms do not tend to 0.