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CLASS 12 MATHEMATICS EXTRA QUESTIONS

Class 12 Mathematics Chapter 8 Applications of Integrals – Extra Questions with Answers

Extra practice questions for Class 12 Maths Chapter 8 (Applications of Integrals), beyond the textbook. These Class 12 Mathematics Chapter 8 important questions are handy for last-minute exam practice.

Contents

Extra practice questions for Class 12 Maths Chapter 8 (Applications of Integrals), beyond the textbook. These Class 12 Mathematics Chapter 8 important questions are handy for last-minute exam practice.

Very Short Answer Questions (1 mark)

Q1. Write the formula for area under y=f(x) from x=a to x=b.
Ans: Area=$\int_a^b|f(x)|dx$.

Q2. What is the area of a circle of radius a using integration?
Ans: πa^2.

Q3. If f(x)≥g(x) on [a,b], write the area formula between them.
Ans: $\int_a^b[f(x)-g(x)]dx$.

Q4. Why do we sketch curves before setting up the integral?
Ans: To correctly identify which curve is upper/lower and the correct limits of integration.

Q5. What is the area enclosed by the parabola $y^2=4ax$ and its latus rectum x=a?
Ans: $8a^2/3$ (standard result).

Short Answer Questions (2–3 marks)

Q6. Find the area bounded by y=x, the x-axis, and the lines x=0, x=4.
Ans: Area=$\int_0^4 x\,dx=[x^2/2]_0^4=8$ sq units.

Q7. Find the area of the region bounded by $y^2=9x$ and x=4 in the first quadrant.
Ans: $y=3\sqrt{x}$. Area=$\int_0^4 3\sqrt{x}\,dx=3[2x^{3/2}/3]_0^4=2(8)=16$ sq units.

Q8. Find the points of intersection of y=x and $y=x^2$.
Ans: $x=x^2 \Rightarrow x^2-x=0 \Rightarrow x(x-1)=0 \Rightarrow x=0,1$. Points: (0,0) and (1,1).

Higher-Order Thinking / Application Questions

Q9. Find the area of the region bounded by the curves $y=x^2$ and y=x, showing the full setup with sketch reasoning and limits.
Ans: First find intersection points: $x^2=x \Rightarrow x(x-1)=0 \Rightarrow x=0$ or $x=1$, giving points (0,0) and (1,1). Between x=0 and x=1, we check which curve is on top by testing a value, say x=0.5: y=x gives 0.5, $y=x^2$ gives 0.25. Since 0.5>0.25, the line y=x lies above the parabola $y=x^2$ throughout this interval. Therefore, Area=$\int_0^1(x-x^2)dx=[x^2/2-x^3/3]_0^1=(1/2-1/3)-0=3/6-2/6=1/6$ sq unit. Geometrically, this represents the small lens-shaped/parabolic-segment region enclosed between the straight line and the parabola between their two intersection points, and the small value (1/6) makes sense given how close the two curves are throughout the unit interval.

Q10. Using integration, find the area of the region in the first quadrant enclosed by the circle $x^2+y^2=4$, the line $x=\sqrt{3}y$, and the x-axis, explaining how the region splits into two parts.
Ans: The circle $x^2+y^2=4$ has radius 2. The line $x=\sqrt{3}y$, i.e., $y=x/\sqrt{3}$, passes through the origin with slope $1/\sqrt{3}$, corresponding to an angle of 30° with the x-axis. To find where the line meets the circle: substitute $x=\sqrt{3}y$ into $x^2+y^2=4$: $3y^2+y^2=4 \Rightarrow 4y^2=4 \Rightarrow y=1$ (taking positive root in first quadrant), so $x=\sqrt{3}$. The intersection point is $(\sqrt{3},1)$. The region in the first quadrant bounded by the circle, the line, and the x-axis splits naturally into two parts: Part 1, from x=0 to $x=\sqrt{3}$, bounded above by the line $y=x/\sqrt{3}$ (since the line is below the circle here); Part 2, from $x=\sqrt{3}$ to x=2, bounded above by the circle $y=\sqrt{4-x^2}$. Part 1

area$=\int_0^{\sqrt{3}}(x/\sqrt{3})dx=(1/\sqrt{3})[x^2/2]_0^{\sqrt{3}}=(1/\sqrt{3})(3/2)=\sqrt{3}/2$. Part 2 area$=\int_{\sqrt{3}}^{2}\sqrt{(4-x^2)}dx=[x\sqrt{(4-x^2)}/2+2\sin^{-1}(x/2)]_{\sqrt{3}}^{2}$ $=(0+2\sin^{-1}(1))-(\sqrt{3}(1)/2+2\sin^{-1}(\sqrt{3}/2))=(2\cdot\pi/2)-(\sqrt{3}/2+2\cdot\pi/3)=\pi-\sqrt{3}/2-2\pi/3=\pi/3-\sqrt{3}/2$. Total area$=\sqrt{3}/2+(\pi/3-\sqrt{3}/2)=\pi/3$ sq units. This demonstrates the standard technique of splitting a composite region into simpler sub-regions when a single integral cannot capture the full boundary in one expression.

Class 12 Mathematics Chapter 8 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the Class 12 Mathematics Chapter 8 Solutions and Class 12 Mathematics Chapter 8 Revision Notes.

See also: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5 | Chapter 6 | Chapter 7 | Chapter 8

Practice more: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5 | Chapter 6 | Chapter 7

Quick revision: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5 | Chapter 6 | Chapter 7