Areas between curves

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. Find the bounded area between $y = x$ and $y = x^2$. [3 marks]

Bounds 0 and 1; upper minus lower $x - x^2$.

$[x^2/2 - x^3/3]_0^1 = 1/6$.

Answer: 1/6

2. Find the bounded area between $y = 4$ and $y = x^2$. [3 marks]

Intersections at ± 2.

Integrate $4 - x^2$ on $[-2, 2]$.

Answer: 32/3

3. Find the area between $y = 3x$ and $y = x$ on $[1, 3]$. [3 marks]

Integrate $2x$ from 1 to 3:$[x^2]_1^3 = 8$.

Answer: 8

4. Find the bounded area between $y = 3x$ and $y = x^2$. [3 marks]

Bounds 0 and 3.
$\int_0^3 (3x - x^2)\,dx = 27/2 - 9 = 9/2$.

Answer: 9/2

5. Find the area between $y = x$ and $y = -x$ on $[-1, 1]$. [3 marks]

The upper curve changes at 0.
$\int_{-1}^0 (-2x)\,dx + \int_0^1 2x\,dx = 1 + 1 = 2$.

Answer: 2

6. Explain why $\int_0^2 (x^2 - 2x)\,dx$ is not the geometric area between $y = x^2$ and $y = 2x$. [3 marks]

It gives $-4/3$; the geometric area is 4/3.

Answer: The integrand is lower minus upper.