Multiple choice questions - Further calculus

Year: Further Maths · 10

Question 1 $\int_1^\infty \frac{1}{x^2}dx =$

- **A.** 0
- **B.** 1
- **C.** ∞
- **D.** 2

Question 2 $\int_1^\infty \frac{1}{\sqrt{x}}dx$:

- **A.** converges to 2
- **B.** converges to 1
- **C.** diverges
- **D.** converges to 0

Question 3 $\int_0^1 \frac{1}{x^{1/3}}dx =$

- **A.** $\frac{3}{2}$
- **B.** $\frac{2}{3}$
- **C.** diverges
- **D.** 3

Question 4 The volume formed by rotating $y = 2$ for $0 \leq x \leq 3$ about the x-axis is:

- **A.** 6π
- **B.** 12π
- **C.** 4π
- **D.** 18π

Question 5 $\int \frac{1}{\sqrt{9-x^2}}dx =$

- **A.** $\arcsin\frac{x}{3} + c$
- **B.** $\arctan\frac{x}{3} + c$
- **C.** $3\arcsin x + c$
- **D.** $\frac{1}{3}\arcsin\frac{x}{3} + c$

Question 6 $\int \frac{1}{4+x^2}dx =$

- **A.** $\frac{1}{2}\arctan\frac{x}{2}+c$
- **B.** $2\arctan\frac{x}{2}+c$
- **C.** $\arctan x+c$
- **D.** $\frac{1}{4}\arctan\frac{x}{2}+c$

Question 7 The mean value of $f(x)=2x$ on $[1,3]$ is:

- **A.** 2
- **B.** 4
- **C.** 8
- **D.** 6

Question 8 For the region between $y=f(x)$ and $y=g(x)$ ($f\geq g\geq 0$) rotated about the x-axis, $V=$

- **A.** $\pi\int(f-g)^2dx$
- **B.** $\pi\int(f^2-g^2)dx$
- **C.** $\pi\int(f-g)dx$
- **D.** $\int(f^2-g^2)dx$

Question 9 $\lim_{x\to 0^+} x\ln x =$

- **A.** $-\infty$
- **B.** 1
- **C.** 0
- **D.** -1

Question 10 $\frac{d}{dx}\arctan x =$

- **A.** $\frac{1}{\sqrt{1+x^2}}$
- **B.** $\frac{1}{1+x^2}$
- **C.** $\frac{1}{1-x^2}$
- **D.** $\sec^2 x$

Answer grid - Further calculus

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Question	Answer	Explanation
1	**B**	$[-1/x]_1^{\infty} = 1$.
2	**C**	$p = \frac{1}{2} \leq 1$, diverges.
3	**A**	$\left[\frac{3}{2}x^{2/3}\right]_0^1$.
4	**B**	A cylinder: $\pi \cdot 4 \cdot 3 = 12\pi$.
5	**A**	Standard form with $a = 3$.
6	**A**	$\frac{1}{a}\arctan\frac{x}{a}$ with $a = 2$.
7	**B**	$\frac{1}{2}\int_1^3 2x\,dx = \frac{1}{2} \cdot 8 = 4$.
8	**B**	Outer disc minus inner disc.
9	**C**	x beats $\ln x$.
10	**B**	Standard derivative.