Name: ..... Serial No: .....

Note: You have to solve first and then select the right answer.

1. $\int x \tan^{-1} x \, dx =$

   (a) $\frac{1}{2}\left(x^2 \tan^{-1} x + \tan^{-1} x - x\right) + C$

   (b) $\frac{1}{2}\left(x \tan^{-1} x - x^2\right) + C$

   (c) $\frac{1}{2}x^2 \tan^{-1} x - \tan^{-1} x + C$

   (d) $x^2 \tan^{-1} x - \tan^{-1} x + C$

   (e) $\frac{x}{x^2+1} + \tan^{-1} x + C$

2. The **average value** of $f(x) = \tan x$ on $\left[0, \frac{\pi}{4}\right]$ is

   (a) $\frac{\pi}{4}$

   (b) $\pi - \ln 2$

   (c) $\frac{3}{\pi}$

   (d) $\frac{2}{\pi} \ln 2$

   (e) $\frac{4}{\pi}$

3. $\int x(\ln(2x))^2\,dx =$

(a) $(1/2)(x\ln(2x))^2 + (1/2)x^2\ln(2x) + x^2 + c$

(b) $(1/2)(x\ln(2x))^2 - (1/2)x^2\ln(2x) + (1/4)x^2 + c$

(c) $(\ln(2x)^3)/3 + x + c$

(d) $(x\ln(2x))^2 + (1/4)x^2 - \ln(2x) + c$

(e) $(\ln(2x)^3)/3 - x + c$

4. $\int_0^{\frac{\pi}{2}} \left(\sin^{3/2} x\right)\left(\cos^3 x\right)\,dx =$

(a) $\frac{4}{5}$

(b) $\frac{8}{45}$

(c) $\frac{5}{9}$

(d) $\frac{11}{45}$

(e) $\frac{13}{45}$

5. The volume of the solid obtained by rotating the region bounded by $y = x^2 - x^3$ and $y = 0$ about the y-axis is

(a) $\frac{\pi}{4}$

(b) $\frac{\pi}{5}$

(c) $\frac{2\pi}{5}$

(d) $\frac{\pi}{20}$

(e) $\frac{\pi}{10}$

6. $\int e^{-\theta}\,\cos(2\theta)\,d\theta =$

(a) $\frac{1}{5}e^{-\theta}\sin(2\theta) - \frac{1}{5}e^{-\theta}\cos(2\theta) + c$

(b) $\frac{1}{5}e^{-\theta}\sin(2\theta) - \frac{2}{5}e^{-\theta}\cos(2\theta) + c$

(c) $\frac{2}{5}e^{-\theta}\sin(2\theta) + \frac{1}{5}e^{-\theta}\cos(2\theta) + c$

(d) $\frac{2}{5}e^{-\theta}\sin(2\theta) - \frac{1}{5}e^{-\theta}\cos(2\theta) + c$

(e) $\frac{2}{5}e^{-\theta}\sin(2\theta) - \frac{2}{5}e^{-\theta}\cos(2\theta) + c$

7. $\int_0^{\frac{\pi^2}{4}} \cos(\sqrt{x})\,dx =$

(a) $-\frac{\pi}{2} - 2$

(b) $\frac{\pi}{2} + 1$

(c) $2\,\pi - 1$

(d) $\pi - \frac{3}{2}$

(e) $\pi - 2$

8. $\int_{\pi/4}^{\pi/2} \csc^4(x)\,dx =$

(a) 0

(b) $\frac{-2}{3}$

(c) $\frac{4}{3}$

(d) $\frac{16}{31}$

(e) $\frac{16}{3}$

9. The value of c that satisfies the Mean Value Theorem of integrals for $f(x) = 1 + 3\sqrt{x}$ over the interval $[0, 1]$ is

(a) $\frac{9}{25}$

(b) $\frac{25}{4}$

(c) $\frac{1}{16}$

(d) $\frac{4}{9}$

(e) $\frac{36}{4}$

10. The region bounded by the graphs of $y = -x^2 + 4x - 3$, and $y = 0$ is rotated about the line $x = -1$. Then the volume of resulting solid is given by

(a) $2\pi \int_1^3 (x-1)(x-2)(x-3)\,dx$

(b) $-2\pi \int_0^1 (x+1)(x-1)(x-3)\,dx$

(c) $-2\pi \int_{-1}^3 (x+1)(x+2)(x-3)\,dx$

(d) $2\pi \int_0^3 (x+1)(x-1)(x+3)\,dx$

(e) $-2\pi \int_1^3 (x+1)(x-1)(x-3)\,dx$