1. $\displaystyle\int_0^{\ln 2} e^{3x}\,dx =$

   a) $\dfrac{7}{3}$
   b) 2
   c) 6
   d) $\dfrac{2}{3}$
   e) $\dfrac{8}{3}$

2. $\displaystyle\int \frac{dx}{(\tan^{-1} x)\,(1+x^2)} =$

   a) $\ln|\tan^{-1} x| + c$
   b) $\tan^{-1}(1+x^2) + c$
   c) $\ln(1+x^2) + c$
   d) $\ln|\tan^{-1} x^2| + c$
   e) $\ln|\tan^{-1}(1+x^2)| + c$

3. If $\int_x^2 f(t)\,dt = x^2 - e^x + 1$, where f is continuous, then $f(x) =$

a) $e^x - 2x$
b) $e^x + 3x$
c) $-x^2 + e^x - 1$
d) $x^2 - e^x + 1$
e) $e^x + 4x$

4. If P is a partition of $[0, 2]$, then $\lim_{\|p\| \to 0} \sum_{k=1}^{n} (c_k\, e^{c_k}) \triangle x_k =$

a) $\int_0^2 x\, e^x\, dx$
b) $\int_0^2 e^x\, dx$
c) $\int_0^2 x\, dx$
d) $\int_0^3 x\, e^x\, dx$
e) $\int_0^3 e^x\, dx$

5. If f is an even function and $\int_{-2}^{2} f(x)\,dx = 4$ and $\int_{-2}^{7} f(x)\,dx = 5$, then $\int_{0}^{7} f(x)\,dx$ is

a) 3
b) 4
c) -1
d) 5
e) -4

6. If f is continuous on $[0, 2]$ and $\int_{0}^{2} f(x)\,dx = 2$, then $\int_{0}^{2} f(2-x)\,dx =$

a) 2
b) 1
c) -1
d) -2
e) 0

7. If $\int \frac{1+\sin x}{\cos^2 x}\, dx =$

a) $\tan x + \sec x + c$
b) $\cos x + \sec x + c$
c) $\cos x - \tan x + c$
d) $\sec x + \csc x + c$
e) $\sin x + \frac{\cos^3\ x}{3} + c$

8. $\int_{-3}^{3} (x\ \cos x + \sqrt{9 - x^2})\, dx =$

a) $\frac{9\pi}{2}$
b) 0
c) $\frac{\pi}{4}$
d) $\frac{9\pi}{8}$
e) $\frac{\pi}{8}$

9. $\int_{-1}^{2} |x^2 - 2x|\, dx =$

a) $\frac{8}{3}$

b) $\frac{4}{3}$

c) 2

d) $\frac{8}{5}$

e) $\frac{4}{5}$

10. The value of $b > 0$ such that the average value of the function $f(x) = b^2x - x^2$ over $[0, b]$ is zero is equal to

a) $\frac{2}{3}$

b) $\frac{1}{2}$

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

d) $\frac{2}{5}$

e) $\frac{1}{3}$

11. The area of the surface of revolution obtained by rotating the curve $y = \frac{1}{2}x^2$, $1 \le x \le 2$ about the y-axis is

a) $\frac{2\pi}{3}(\sqrt{125} - \sqrt{8})$
b) $\frac{\pi}{3}(\sqrt{125} + \sqrt{8})$
c) $\frac{\pi}{4}(\sqrt{125} - \sqrt{8})$
d) $\frac{3\pi}{2}(\sqrt{125} - \sqrt{8})$
e) $\frac{2\pi}{5}(\sqrt{125} + \sqrt{8})$

12. The area enclosed by the lines $y = 3x$, $y = -3x$ and $y = 4x - 1$ is equal to

a) $\frac{3}{7}$
b) $\frac{5}{7}$
c) $\frac{1}{7}$
d) $\frac{1}{3}$
e) $\frac{5}{3}$

13. The area of the region bounded by the curves $y^2 - x = 4$ and $x = 2 - y^2$ is equal to

a) $8\sqrt{3}$
b) 6
c) 4
d) $4\sqrt{3}$
e) $\sqrt{3}$

14. $\displaystyle\int \frac{12x + 15}{\sqrt{2x - 3}}\, dx =$

a) $2(2x-3)^{3/2} + 33(2x-3)^{1/2} + c$
b) $2(2x-3)^{3/2} + 11(2x-3)^{1/2} + c$
c) $2(2x-3)^{3/2} + 15(2x-3)^{1/2} + c$
d) $2(2x-3)^{3/2} + 12(2x-3)^{1/2} + c$
e) $2(2x-3)^{3/2} + 18(2x-3)^{1/2} + c$

15. The region bounded by the curves $y = \sqrt{x}$ and $y = x^2 + 1$ between $x = 0$ and $x = 1$ is revolved about the y-axis. Then the volume of the solid generated is equal to

a) $\frac{7\pi}{10}$

b) $\frac{3\pi}{10}$

c) $\frac{9\pi}{10}$

d) $\frac{11\pi}{10}$

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

16. The length of the curve $y = \int_0^x \sqrt{\tan^2 t - 1}\, dt$ on the interval $\left[0, \frac{\pi}{4}\right]$ is

a) $\frac{1}{2} \ln 2$

b) $2 \ln 2$

c) 1

d) $\ln 2$

e) $3 \ln 2$

17. $\int \sqrt{\dfrac{5\theta - 3}{2\theta^5}}\, d\theta =$

a) $\dfrac{4}{9}\left(\dfrac{5}{2} - \dfrac{3}{2\theta}\right)^{3/2} + c$

b) $\dfrac{3}{5}\left(\dfrac{5}{2} - \dfrac{3}{2\theta}\right)^{3/2} + c$

c) $\dfrac{3}{10}\left(\dfrac{5}{2} - \dfrac{3}{2\theta}\right)^{3/2} + c$

d) $\dfrac{1}{6}\left(\dfrac{5}{2} - \dfrac{3}{2\theta}\right)^{3/2} + c$

e) $\dfrac{5}{8}\left(\dfrac{5}{2} - \dfrac{3}{2\theta}\right)^{3/2} + c$

18. The volume of the solid generated by rotating the region bounded by the curves $y = x^3$ and $x = y^2$ about the line $y = -1$ is given by

a) $\pi \int_0^1 (2\sqrt{x} + x - 2x^3 - x^6)\, dx$

b) $\pi \int_0^1 (2\sqrt{x} + x + 3x^3 - x^6)\, dx$

c) $\pi \int_0^1 (2\sqrt{x} - x - 2x^3 - x^6)\, dx$

d) $\pi \int_0^1 (2\sqrt{x} - 3x + 2x^3 - x^6)\, dx$

e) $\pi \int_0^1 (\sqrt{x} + 3x - 2x^3 + x^6)\, dx$

19. A solid has a base lying in the first quadrant and bounded by the curves $y = 4 - x^2, x = 0$ and $y = 0$. If the cross sections of the solid perpendicular to the y-axis are equilateral triangles with the base running from the y-axis to the curve, then the volume of the solid is equal to

a) $2\sqrt{3}$
b) 4
c) $5\sqrt{3}$
d) 6
e) $2\sqrt{2}$

20. If the area enclosed by the circle $y^2 + (x-1)^2 = 1$ is rotated about the y-axis, then the volume of the resulting solid is

a) $2\pi^2$
b) $\frac{2\pi}{3}$
c) $3\pi^2$
d) $\frac{\pi^2}{3}$
e) $\frac{4\pi}{3}$