1. The volume of the solid generated by rotating the region bounded by the curves $x = y^2$, $x = 6y - 2y^2$ about x-axis can be represented by

(a) $6\,\pi \int_0^2 y^2\,(2-y)\,dy$

(b) $6\,\pi \int_0^2 x^2\,(2-x)\,dx$

(c) $6\,\pi \int_0^1 y^2\,(2-y)\,dy$

(d) $6\,\pi \int_0^1 x^2\,(2-x)\,dx$

(e) $6\,\pi \int_0^2 y\,(2-y^2)\,dy$

2. The volume of the solid generated by rotating the region bounded by the curves $y = -x^2 - x$, $y = 0$ about $x = 1$, equals to

(a) $\dfrac{\pi}{2}$

(b) $\dfrac{\pi}{4}$

(c) $2\,\pi$

(d) $\dfrac{\pi}{3}$

(e) $6\,\pi$

3. The average value of $f(x) = \sin^{-1} x$ on the interval $[0, 1]$, equals

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

(b) $\dfrac{\pi}{2}$

(c) $\dfrac{\pi}{3} - 2$

(d) 0

(e) $2\,\pi$

4. The sum of all numbers c such that $f(c)$ equals the average value of the function $f(x) = 3x^2 - x + 4$ over the interval $[-1, 1]$ is

(a) $\dfrac{1}{3}$

(b) $\dfrac{1}{6}$

(c) $\dfrac{1}{2}$

(d) 2

(e) 1

5. $\int_0^{\pi/6} \sin(4x)\,\cos(2x)\,dx =$

(a) $\dfrac{7}{24}$

(b) $\dfrac{3}{4}$

(c) $\dfrac{1}{2}$

(d) $\dfrac{5}{12}$

(e) $\dfrac{17}{32}$

6. $\int x\,\sec(x)\,\tan(x)\,dx =$

(a) $x\,\sec\,x - \ln|\sec\,x + \tan\,x| + C$

(b) $\dfrac{x^2}{2} + \sec\,x + C$

(c) $\dfrac{x^2}{2}\,\sec\,x + C$

(d) $x^3\,\tan\,x - \ln|\sec\,x + \tan\,x| + C$

(e) $x^2\,\sec\,x - \ln|\sec\,x| + C$

7. $\int e^{2x} \sin(x)\, dx =$

(a) $\frac{e^{2x}}{5}(2 \sin x - \cos x) + C$

(b) $\frac{e^{2x}}{5}(3 \sin x + \cos x) + C$

(c) $\frac{e^{2x}}{3}(2 \cos x - \sin x) + C$

(d) $\frac{e^{2x}}{2}(3 \sin x + \cos x) + C$

(e) $\frac{e^{2x}}{7}(5 \sin x - \cos x) + C$

8. $\int \frac{1 - \tan\theta}{1 + \tan\theta}\, d\theta =$

(a) $\ln|\cos\theta + \sin\theta| + C$

(b) $\ln|1 + \tan\theta| + C$

(c) $\tan\theta - \sec\theta + C$

(d) $\sec^2\theta - \tan\theta + C$

(e) $\ln|\sec^2\theta - \tan^2\theta| + C$

9. $\int_{-\pi/2}^{0} \sqrt{1-\cos x}\, dx =$

(a) $2\sqrt{2}-2$

(b) $2\sqrt{2}+1$

(c) $\sqrt{2}-3$

(d) $2-2\sqrt{2}$

(e) $3-\sqrt{2}$

10. The partial fractions decompostion fo the the rational function

$$\frac{1}{x^2(x-1)(x^2+2x+2)(x^2+x-2)} =$$

(a) $\dfrac{A}{x}+\dfrac{B}{x^2}+\dfrac{C}{x-1}+\dfrac{D}{(x-1)^2}+\dfrac{E}{x+2}+\dfrac{Fx+H}{x^2+2x+2}$

(b) $\dfrac{A}{x}+\dfrac{B}{x-1}+\dfrac{Cx+D}{x^2+2x+2}+\dfrac{Ex+F}{(x^2+x-2)}$

(c) $\dfrac{A}{x}+\dfrac{B}{x^2}+\dfrac{C}{x-1}+\dfrac{Dx+E}{x^2+2x+2}+\dfrac{Fx+G}{(x^2+2x+2)^2}$

(d) $\dfrac{A}{x}+\dfrac{B}{x-1}+\dfrac{C}{x+2}+\dfrac{Dx+E}{x^2+2x+2}$

(e) $\dfrac{A}{x}+\dfrac{B}{x^2}+\dfrac{C}{x-1}+\dfrac{D}{(x-1)^2}+\dfrac{E}{x+2}+\dfrac{F}{(x+2)^2}$

11. $\int \sqrt{9-x^2}\,dx =$

(a) $\frac{9}{2}\sin^{-1}\left(\frac{x}{3}\right)+\frac{x}{2}\sqrt{9-x^2}+C$

(b) $\frac{3}{2}\sin^{-1}\left(\frac{x}{2}\right)+\frac{3x}{2}\sqrt{9-x^2}+C$

(c) $9\,\sec^{-1}\left(\frac{x}{3}\right)+x\sqrt{9-x^2}+C$

(d) $\frac{3}{2}\sec^{-1}\left(\frac{x}{3}\right)+\frac{3x}{2}\sqrt{9-x^2}+C$

(e) $\frac{9}{2}\sqrt{9-x^2}+C$

12. $\int \frac{\sqrt{4x^2-1}}{x}\,dx =$

(a) $\sqrt{4x^2-1}-\sec^{-1}(2x)+C$

(b) $\sqrt{4x^2-1}-\sec^{-1}\left(\frac{x}{2}\right)+C$

(c) $\frac{\sqrt{4x^2-1}}{2}-\sin^{-1}(2x)+C$

(d) $\frac{\sqrt{4x^2-1}}{2x}-\sin^{-1}(2x)+C$

(e) $2x\sqrt{4x^2-1}-\tan^{-1}\left(\frac{x}{2}\right)+C$

13. $\displaystyle\int \frac{x-9}{(x+5)(x-2)}\,dx =$

(a) $\displaystyle \ln\left|\frac{(x+5)^2}{x-2}\right| + C$

(b) $\displaystyle \ln\left|\frac{x-2}{(x+5)^2}\right| + C$

(c) $\displaystyle \ln\left|\frac{(x+5)^{1/2}}{x-2}\right| + C$

(d) $\displaystyle \tan^{-1}\left(\frac{(x+5)^{1/3}}{(x-2)}\right) + C$

(e) $\displaystyle \frac{1}{2(x-2)} + \sqrt{x+5} + C$

14. $\displaystyle\int \frac{1}{\sqrt{x}+\sqrt[3]{x}}\,dx =$

(a) $2\sqrt{x} - 3\sqrt[3]{x} + 6\sqrt[6]{x} - 6\ln|\sqrt[6]{x-1}| + C$

(b) $\displaystyle \frac{x^3}{3} - \frac{x^2}{2} + x + \ln|x-1| + C$

(c) $\ln|x-1| - \tan\sqrt[3]{x} + C$

(d) $\displaystyle \sqrt{x} - \sqrt[3]{x} + \sqrt[6]{x} - \frac{1}{x-1} + C$

(e) $\displaystyle \sqrt{x} - 3\sqrt[6]{x} - \ln|x-1| + \frac{1}{x-1} + C$

15. By using the substitution $t = \tan\left(\frac{x}{2}\right)$, then $\int_0^{\pi/2} \left(\frac{\sin(2x)}{2+\cos\, x}\right) dx =$

(a) $\int_0^1 \frac{8t(1-t^2)}{(3+t^2))(1+t^2)^2}\, dt$

(b) $\int_0^1 \frac{(1-t^2)}{(1+t^2)(2+t^2)}\, dt$

(c) $\int_0^1 \frac{4t(1-t^2)}{(1+2t+t^2)^2}\, dt$

(d) $\int_0^{1/2} \frac{2t(1-t^2)}{(1+t^2)}\, dt$

(e) $\int_0^{1/2} \frac{(1-t^2)}{(1+t^2)^2}\, dt$

16. $\int_0^1 x^2\sqrt{1-x^2}\, dx =$

(a) $\frac{\pi}{16}$

(b) $\frac{\pi}{15}$

(c) $\frac{\pi}{17}$

(d) $\frac{\pi}{14}$

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

17. The improper integral $\int_0^2 \frac{t}{t-2}\,dt$

(a) diverges

(b) converges to ln 2

(c) converges to 0

(d) converges to e^2

(e) convergest to 1

18. The improper integral $\int_1^\infty \frac{-e^{-\sqrt{x}}}{2\sqrt{x}(1+e^{-\sqrt{x}})}\,dx$

(a) converges to $\ln\left(\frac{1}{1+e^{-1}}\right)$

(b) converges to $\ln(1-e^{-1})$

(c) converges to 1

(d) converges to 0

(e) diverges

19. $\int_0^{\pi^3} \cos \sqrt[3]{x}\, dx =$

(a) $-6\,\pi$

(b) $3\,\pi^3$

(c) $-\pi$

(d) $-2\,\pi^3$

(e) $\pi^{1/3}$

20. $\int \dfrac{\cos^3 \theta}{\sin^{2/3} \theta}\, d\theta =$

(a) $3(\sin\,\theta)^{1/3} - \dfrac{3}{7}(\sin\,\theta)^{7/3} + C$

(b) $3(\cos\,\theta)^{1/3} - \dfrac{3}{7}(\cos\,\theta)^{7/3} + C$

(c) $3(\sin\,\theta)^{1/3} - \dfrac{3}{5}(\sin\,\theta)^{5/3} + C$

(d) $3(\cos\,\theta)^{1/3} - \dfrac{3}{5}(\cos\,\theta)^{5/3} + C$

(e) $\dfrac{3}{5}(\sin\,\theta)^{5/3} + \dfrac{1}{4}(\cos\,\theta)^4 + C$