1. $\int \sqrt{x} \sin x^{\frac{3}{2}}\, dx$

2. If $\int_0^6 f(x)\,dx = 12$, what is the value of $\int_0^6 f(6-x)\,dx$?

(A) 12 (B) 6 (C) 0 (D) -6

3. If the substitution $u = 1+\sqrt{x}$ is made, $\int \dfrac{(1+\sqrt{x})^{3/2}}{\sqrt{x}}\,dx =$

(A) $\frac{1}{2}\int u^{3/2}\,du$ (B) $2\int u^{3/2}\,du$ (C) $\frac{1}{2}\int \sqrt{u}\,du$ (D) $2\int \sqrt{u}\,du$

4. If the substitution $u = \ln x$ is made, $\int_e^{e^2} \dfrac{1-(\ln x)^2}{x}\,dx =$

(A) $\int_e^{e^2} (\frac{1}{u} - u^2)\,du$

(B) $\int_e^{e^2} (\frac{1}{u} - u)\,du$

(C) $\int_1^2 (1-u^2)\,du$

(D) $\int_1^2 (1-u)\,du$

5. If f is continuous and $\int_1^8 f(x)\,dx = 15$, find the value of $\int_1^2 x^2 f(x^3)\,dx$.

1. $\int_1^3 \frac{x+3}{x^2+6x}\,dx$

2. $\int_0^1 \frac{x}{e^{x^2}}\,dx$

3. Which of the following is the antiderivative of $f(x) = \tan x$?

   (A) $\sec x + \tan x + C$

   (B) $\csc x + \cot x + C$

   (C) $\ln|\csc x| + C$

   (D) $-\ln|\cos x| + C$

4. What is the area of the region in the first quadrant bounded by the curve $y = \frac{\cos x}{2+\sin x}$ and the vertical line $x = \frac{\pi}{2}$?

5. $\int_0^2 \frac{x^2}{x+1}\,dx$

6. $\int_1^e \frac{\cos(\ln x)}{x}\,dx$

1. $\int_0^{\pi} 4\sin^4\theta\, d\theta =$

2. $\int_0^{\frac{\pi}{4}} 4\tan^2\theta\, d\theta =$

3. $\int \sec^4 x\, dx =$

4. Find the area bounded by the curves $y = \sin x$ and $y = \sin^3 x$ between $x = 0$ and $x = \frac{\pi}{2}$

1. If the substitution $x = 2\tan\theta$ is made in $\int \frac{x^3}{\sqrt{x^2+4}}\,dx$, where $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$, the resulting integral is

(A) $4\int \tan^2\theta \sec\theta \, d\theta$

(B) $4\int \tan^2\theta \sec^2\theta \, d\theta$

(C) $8\int \tan^3\theta \, d\theta$

(D) $8\int \tan^3\theta \sec\theta \, d\theta$

2. $\int_{\sqrt{2}}^{2} \frac{1}{x\sqrt{x^2-1}}\,dx =$

3. If $0 < \theta < \frac{\pi}{2}$, then $\int \frac{\sqrt{x^2-1}}{x^4} dx =$ ________________

1. $\int \frac{dx}{x^2+x-6} =$

2. $\int_4^7 \frac{5}{(x-2)(2x+1)}\,dx =$

3. $\int \frac{x}{x^2+5x+6}\,dx =$

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

5. Let f be the function given by $f(\theta) = \int \frac{\sin\theta}{\cos\theta(\cos\theta - 1)}\,d\theta$.

   (a) Substitute $x = \cos\theta$ and write an integral expression for f in terms of x.

   (b) Use the method of partial fractions to find $f(\theta)$.

1. $\int x\sin(2x)\,dx =$

2. $\int_0^2 xe^x\,dx =$

3. If $\int x^2\cos(3x)\,dx = f(x) - \frac{2}{3}\int x\sin(3x)\,dx$, then $f(x) =$

4. $\int x^2 \ln x\,dx =$

5. $\int_0^{\pi/4} x\sec^2 x\,dx =$

6. $\int \sec^3 x\,dx =$

7. $\int f(x)\cos(nx)\,dx =$

(A) $\frac{1}{n}f(x)\sin(nx) - \frac{1}{n}\int f'(x)\sin(nx)\,dx$

(B) $\frac{1}{n}f(x)\cos(nx) - \frac{1}{n}\int f'(x)\cos(nx)\,dx$

(C) $n\,f(x)\cos(nx) + \frac{1}{n}\int f'(x)\sin(nx)\,dx$

(D) $n\,f(x)\cos(nx) - \frac{1}{n}\int f'(x)\cos(nx)\,dx$

8. If $\int \arccos x\,dx = x\arccos x + \int f(x)\,dx$, then $f(x) =$

(A) $-x\sqrt{1-x^2}$ (B) $x\sqrt{1-x^2}$ (C) $-\frac{1}{\sqrt{1-x^2}}$ (D) $\frac{x}{\sqrt{1-x^2}}$

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	-2	3	4	-1
3	2	-1	-3	5

9. The table above gives values of f, f', g, and g' for selected values of x.
If $\int_1^3 f(x)g'(x)\,dx = 8$, then $\int_1^3 f'(x)g(x)\,dx =$

(A) -4 (B) -1 (C) 5 (D) 8

10. Find the area of the region bounded by $y = \arcsin x$, $y = 0$, and $x = 1$. Show the work that leads to your answer.

1. $\int_2^{\infty} \frac{1}{\sqrt{x-1}}\, dx =$

2. $\int_0^{\infty} \frac{1}{(x+3)(x+4)}\, dx =$

3. $\int_0^{4} \frac{dx}{(x-1)^{2/3}} =$

(A) $3\sqrt[3]{3}$ (B) $3(1-\sqrt[3]{3})$ (C) $3(1+\sqrt[3]{3})$ (D) divergent

4. $\int_0^{\infty} x^2 e^{-x^3} =$

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) 1 (D) divergent

5. $\int_0^{1} \frac{\ln x}{\sqrt{x}}\, dx =$

(A) -6 (B) -4 (C) -2 (D) divergent

6. If $\int_0^{1} \frac{ke^{-\sqrt{x}}}{\sqrt{x}}\, dx = 1$, what is the value of k?

(A) $-\frac{1}{2}$ (B) $\frac{e}{2}$ (C) $\frac{1}{2}$ (D) There is no such value of k

7. Let f be the function given by $f(x) = \frac{x}{\sqrt{x^2+1}}\, dx$.

(a) Show that the improper integral $\int_1^{\infty} f(x)\, dx$ is divergent.

(b) Find the average value of f on the interval $[1,\infty)$.