Calculus

Chapter 5: Integration

Lesson 4: Integrals and Antiderivatives

Question #1

Reference Q.432
Find the antiderivative.
$\int x^3 dx$

Question #2

Reference Q.433
Find the antiderivative.
$\int x^{\frac{3}{4}} dx$

Question #3

Reference Q.434
Find the antiderivative.
$\int \left[\frac{3}{4x^2} - x\right] dx$

Question #4

Reference Q.435
Find the antiderivative.
$\int \left[\frac{1}{x^4} + 2x^{\frac{2}{3}} - 10x^4\right] dx$

Question #5

Reference Q.436
Find the antiderivative.
$\int x^2 \sqrt[3]{x} dx$

Question #6

Reference Q.437
Find the antiderivative.
$\int x^2 \left(1 - x^2\right) dx$

Question #7

Reference Q.438
Find the antiderivative.
$\int 2e^x + \cos x \, dx$

Question #8

Reference Q.439
Find the antiderivative.
$\int \frac{x^5 - 2x^3 + 1}{x^2} dx$

Question #9

Reference Q.440
Find the antiderivative.
$\int \frac{3}{x} + 2\sin x \, dx$

Question #10

Reference Q.441
Find the antiderivative.
$\int -\csc x \cot x + \sec^2 x \, dx$

Question #11

Reference Q.442
Find the antiderivative.
$\int 2\csc^2 x - \sin x \, dx$

Question #12

Reference Q.444
Find the antiderivative.
$\int \frac{\cos x}{(\sin x)^2} dx$

Question #13

Reference Q.445
Find the antiderivative.
$\int \left(1 + [\cos\theta]^2 \sec\theta\right) d\theta$

Question #14: Proof: Properties of Integrals #1

Reference Q.64815
Prove $\int (f(x) \pm g(x)) dx = \int f(x) dx \pm \int g(x) dx$

Question #15: Proof: Properties of Integrals #2

Reference Q.64818

Prove $\int_a^b f(x)dx = -\int_b^a f(x)dx$(Hint: Use this Reimann Sum definition of the Integral:
$\int_a^b f(x)dx = \lim_{n\to\infty} \sum_{k=1}^{n} f\left(x_k^*\right) \Delta x$, where $\Delta x = \frac{b-a}{n}$)

Question #16

Reference Q.443

Find the antiderivative.

$$\int \cot x \left(\frac{1}{\sin x \cos x}\right) \, dx$$

Question #17

Reference Q.446

If $f\text{''}(x) = a$, where a is a constant, find $f(x)$. [Hint: First find $f'(x)$ by integrating, and then find $f(x)$.]

Question #18

Reference Q.9231

If $\int x^3 \sec^2 x \, dx = f(x) - \int 3x^2 \tan x \, dx$, what is $f(x)$?

Question #19

Reference Q.9232

Which of the following functions are equivalent to $\int \frac{dx}{\sqrt{-4(x^2-1)}}$?

(A) $\frac{1}{2}\arcsin x + C$

(B) $\frac{1}{2}\frac{\ln|x+1|}{\sqrt{x-1}} + C$

(C) $\frac{1}{2}\arctan x + C$

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

Question #20

Reference Q.9233

Which of the following are equivalent to $\int \frac{dx}{x^2+1}$

(A) $\ln|x^2+1| + C$

(B) $\arctan x + C$

(C) $\frac{1}{x+1} + C$

(D) $\arcsin x + C$

Question #21

Reference Q.50212

Integrate the following by using long division: $\int \frac{9x^2}{3x+1} dx$

Question #22

Reference Q.50215

Integrate the following by using long division: $\int \frac{4x^2-3x+2}{x-3} dx$

Question #23

Reference Q.50218

Integrate the following by using long division: $\int \frac{16x^3+3}{2x-1} dx$

Question #24

Reference Q.50185

Integrate the following by completing the square: $\int \frac{20}{\sqrt{(15-x^2-2x)}} dx$

Question #25

Reference Q.50188

Integrate the following by completing the square: $\int \frac{18}{x^2-4x+13} dx$

Question #26

Reference Q.50191

Integrate the following by completing the square: $\int \frac{-7}{\sqrt{33-x^2-8x}}dx$