Calculus

Chapter 5: Integration

Lesson 3: The Fundamental Theorem of Calculus

Question #1

Reference Q.412
Find the area under the following function:
$f(x) = 3x^3$ on the interval [4,7]

Question #2

Reference Q.413
Find the area under the following function:
$f(x) = \sqrt[3]{x}$ on the interval [1,27]

Question #3

Reference Q.414
Find the area under the following function:
$f(x) = 6\csc^2 x$ on the interval $[\frac{\pi}{3}, \frac{2\pi}{3}]$

Question #4

Reference Q.415
Evaluate:
$\int_{-4}^{1} 3x - x^2 \, dx$

Question #5

Reference Q.416
Evaluate:
$\int_{0}^{\pi} \sin x \, dx$

Question #6

Reference Q.417
Evaluate:
$\int_{1}^{5} \frac{dx}{x^3}$

Question #7

Reference Q.418
Evaluate:
$\int_{-\ln 3}^{\ln 6} 3e^x dx$

Question #8

Reference Q.419
Evaluate:
$\int_{0}^{\pi/4} \sec^2 x \, dx$

Question #9

Reference Q.420
Evaluate:
$\int_{\frac{\sqrt{2}}{2}}^{\frac{2}{\sqrt{3}}} \frac{6}{1+x^2} \, dx$

Question #10

Reference Q.421
Evaluate:
$\int_{\frac{\sqrt{3}}{3}}^{1} \frac{dx}{1+x^2}$

Question #11

Reference Q.422
Evaluate:
$\int_{1}^{2} |3x - 2| \, dx$ Hint: Write it as a piecewise function first.

Question #12

Reference Q.423
Find the area under the following curve over the given interval, and sketch the region:
$f(x) = 2x^2 - 1$ on the interval [0,4]

a. sketch

b. evaluate

Question #13

Reference Q.424
Find the area under the following curve over the given interval, and sketch the region:
$f(x) = 4x - x^3$ on the interval [-3,3]

a. sketch

b. area

Question #14

Reference Q.425
Find the area under the following curve over the given interval, and sketch the region:
$f(x) = 3e^{x-1} + 2$ on the interval [1, 2]

a. sketch

b. area

Question #15

Reference Q.426
Evaluate using FTOC Part I:
$\frac{d}{dx} \int_3^x \ln(w) dw$

Question #16

Reference Q.427
Evaluate using FTOC Part I:
$\frac{d}{dx} \int_{-5}^x \cos\sqrt{u} du$

Question #17

Reference Q.430
Evaluate using FTOC Part I:
$\frac{d}{dx} \int_{-5}^{x^3} \ln(3t - 4) dt$

Question #18

Reference Q.431
Evaluate using FTOC Part I:
$\frac{d}{dx} \int_e^{cosx} \sec(x) \tan(x) dx$

Question #19

Reference Q.9227
If $F(x) = \int_1^x e^{2t}\ dt$. then what is $F'(x)$, if it exists?

Question #20

Reference Q.9228
Evaluate, if possible, using the Fundamental Theorem of Calculus Part I: $\frac{d}{dx}\left(x \int_0^x \cos t\ dt\right)$

Question #21

Reference Q.9229
Using the Fundamental Theorem of Calculus Part II, show that
$\int_a^c f(x)\ dx = \int_a^b f(x)\ dx + \int_b^c f(x)\ dx$.

Question #22

Reference Q.9230
Which of the following is equivalent to $\ln 7$?
(A) $\int_1^7 \ln x\ dx$
(B) $\int_0^7 \frac{1}{x}\ dx$
(C) $\int_0^6 \frac{1}{x+1}\ dx$
(D) $\int_0^6 \ln x + 1\ dx$