

AB Calculus  
Chapter 7 Review

$$\int x^2 \cos(x^3) dx =$$

2003 AB 8

(A)  $-\frac{1}{3} \sin(x^3) + C$

(B)  $\frac{1}{3} \sin(x^3) + C$

(C)  $-\frac{x^3}{3} \sin(x^3) + C$

(D)  $\frac{x^3}{3} \sin(x^3) + C$

(E)  $\frac{x^3}{3} \sin\left(\frac{x^4}{4}\right) + C$

$$\int_0^1 e^{-4x} dx =$$

2003 AB 2

(A)  $\frac{-e^{-4}}{4}$

(B)  $-4e^{-4}$

(C)  $e^{-4} - 1$

(D)  $\frac{1}{4} - \frac{e^{-4}}{4}$

(E)  $4 - 4e^{-4}$

What is the average value of  $y = x^2 \sqrt{x^3 + 1}$  on the interval  $[0, 2]$ ?

1998 AB 27

1985 AB 44

*(different answer options)*

(A)  $\frac{26}{9}$

(B)  $\frac{52}{9}$

(C)  $\frac{26}{3}$

(D)  $\frac{52}{3}$

(E) 24

$$\int \tan(2x) dx =$$

1985 AB 30

- (A)  $-2 \ln |\cos(2x)| + C$       (B)  $-\frac{1}{2} \ln |\cos(2x)| + C$       (C)  $\frac{1}{2} \ln |\cos(2x)| + C$   
(D)  $2 \ln |\cos(2x)| + C$       (E)  $\frac{1}{2} \sec(2x) \tan(2x) + C$
- 

$$\int_0^{\frac{\pi}{3}} \sin(3x) dx =$$

1985 AB 32

- (A) -2      (B)  $-\frac{2}{3}$       (C) 0      (D)  $\frac{2}{3}$       (E) 2
- 

$$\int_1^2 \frac{x-4}{x^2} dx =$$

1973 AB 30

- (A)  $-\frac{1}{2}$       (B)  $\ln 2 - 2$       (C)  $\ln 2$       (D) 2      (E)  $\ln 2 + 2$
-

$$\int \frac{x^2}{e^{x^3}} dx =$$

1969 AB 38

(A)  $-\frac{1}{3} \ln e^{x^3} + C$

(B)  $-\frac{e^{x^3}}{3} + C$

(C)  $-\frac{1}{3e^{x^3}} + C$

(D)  $\frac{1}{3} \ln e^{x^3} + C$

(E)  $\frac{x^3}{3e^{x^3}} + C$

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$$\int (x^2 + 1)^2 dx =$$

1993 AB 17 Calc

(A)  $\frac{(x^2 + 1)^3}{3} + C$

(B)  $\frac{(x^2 + 1)^3}{6x} + C$

(C)  $\left( \frac{x^3}{3} + x \right)^2 + C$

(D)  $\frac{2x(x^2 + 1)^3}{3} + C$

(E)  $\frac{x^5}{5} + \frac{2x^3}{3} + x + C$

---

$$\int_{\pi/4}^{\pi/2} \frac{\cos x}{\sin x} dx =$$

1969 AB 29

(A)  $\ln \sqrt{2}$

(B)  $\ln \frac{\pi}{4}$

(C)  $\ln \sqrt{3}$

(D)  $\ln \frac{\sqrt{3}}{2}$

(E)  $\ln e$

---

$$\int_0^{\sqrt{3}} \frac{dx}{\sqrt{4-x^2}} =$$

1993 AB 32  
Calc

(A)  $\frac{\pi}{3}$

(B)  $\frac{\pi}{4}$

(C)  $\frac{\pi}{6}$

(D)  $\frac{1}{2} \ln 2$

(E)  $-\ln 2$

$$\int \frac{x dx}{\sqrt{3x^2+5}} =$$

1988 AB 7

(A)  $\frac{1}{9}(3x^2+5)^{\frac{3}{2}} + C$

(B)  $\frac{1}{4}(3x^2+5)^{\frac{3}{2}} + C$

(C)  $\frac{1}{12}(3x^2+5)^{\frac{1}{2}} + C$

(D)  $\frac{1}{3}(3x^2+5)^{\frac{1}{2}} + C$

(E)  $\frac{3}{2}(3x^2+5)^{\frac{1}{2}} + C$

$$\int_0^8 \frac{dx}{\sqrt{1+x}} =$$

1969 AB 4

- (A) 1                    (B)  $\frac{3}{2}$                     (C) 2                    (D) 4                    (E) 6

If  $\frac{dy}{dx} = \cos(2x)$ , then  $y =$

1985 AB 4

- (A)  $-\frac{1}{2}\cos(2x) + C$                     (B)  $-\frac{1}{2}\cos^2(2x) + C$                     (C)  $\frac{1}{2}\sin(2x) + C$   
(D)  $\frac{1}{2}\sin^2(2x) + C$                     (E)  $-\frac{1}{2}\sin(2x) + C$

Which of the following are antiderivatives of  $f(x) = \sin x \cos x$ ?

1997 AB 90 calc

I.  $F(x) = \frac{\sin^2 x}{2}$

II.  $F(x) = \frac{\cos^2 x}{2}$

III.  $F(x) = \frac{-\cos(2x)}{4}$

- (A) I only  
(B) II only  
(C) III only  
(D) I and III only  
(E) II and III only

$$\int_2^3 \frac{x}{x^2 + 1} dx =$$

1988 AB 19

(A)  $\frac{1}{2} \ln \frac{3}{2}$

(B)  $\frac{1}{2} \ln 2$

(C)  $\ln 2$

(D)  $2 \ln 2$

(E)  $\frac{1}{2} \ln 5$

2003 AB 19

A curve has slope  $2x + 3$  at each point  $(x, y)$  on the curve. Which of the following is an equation for this curve if it passes through the point  $(1, 2)$ ?

- (A)  $y = 5x - 3$
- (B)  $y = x^2 + 1$
- (C)  $y = x^2 + 3x$
- (D)  $y = x^2 + 3x - 2$
- (E)  $y = 2x^2 + 3x - 3$

If  $\frac{dy}{dx} = \tan x$ , then  $y =$

1969 AB 27

- (A)  $\frac{1}{2} \tan^2 x + C$
  - (B)  $\sec^2 x + C$
  - (C)  $\ln|\sec x| + C$
  - (D)  $\ln|\cos x| + C$
  - (E)  $\sec x \tan x + C$
-

If  $\frac{dy}{dx} = 4y$  and if  $y = 4$  when  $x = 0$ , then  $y =$

1973 AB 37

- (A)  $4e^{4x}$       (B)  $e^{4x}$       (C)  $3 + e^{4x}$       (D)  $4 + e^{4x}$       (E)  $2x^2 + 4$

If  $\frac{dy}{dt} = ky$  and  $k$  is a nonzero constant, then  $y$  could be

1998 AB 21

- (A)  $2e^{kt}$       (B)  $2e^{kt}$       (C)  $e^{kt} + 3$       (D)  $kty + 5$       (E)  $\frac{1}{2}ky^2 + \frac{1}{2}$

2008 AB 22

A rumor spreads among a population of  $N$  people at a rate proportional to the product of the number of people who have heard the rumor and the number of people who have not heard the rumor. If  $p$  denotes the number of people who have heard the rumor, which of the following differential equations could be used to model this situation with respect to time  $t$ , where  $k$  is a positive constant?

(A)  $\frac{dp}{dt} = kp$

(B)  $\frac{dp}{dt} = kp(N - p)$

(C)  $\frac{dp}{dt} = kp(p - N)$

(D)  $\frac{dp}{dt} = kt(N - t)$

(E)  $\frac{dp}{dt} = kt(t - N)$

**Separable Differential Equations Practice**

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**Find the general solution of each differential equation.**

1)  $\frac{dy}{dx} = \frac{x^3}{y^2}$

2)  $\frac{dy}{dx} = \frac{1}{\sec^2 y}$

3)  $\frac{dy}{dx} = 3e^{x-y}$

4)  $\frac{dy}{dx} = \frac{2x}{e^{2y}}$

**For each problem, find the particular solution of the differential equation that satisfies the initial condition.**

5)  $\frac{dy}{dx} = \frac{2x}{y^2}, y(2) = \sqrt[3]{13}$

6)  $\frac{dy}{dx} = 2e^{x-y}, y(-3) = \ln \frac{3e^3 + 2}{e^3}$

7)  $\frac{dy}{dx} = \frac{1}{\sec^2 y}, y(3) = 0$

8)  $\frac{dy}{dx} = \frac{e^x}{y^2}, y(-1) = \frac{\sqrt[3]{e^3 + 3e^2}}{e}$

9)  $\frac{dy}{dx} = -\frac{1}{\sin y}, y(3) = \frac{\pi}{2}$

10)  $\frac{dy}{dx} = \frac{2x}{e^{2y}}, y(2) = \frac{\ln 5}{2}$

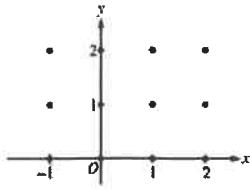
11)  $\frac{dy}{dx} = \frac{3x^2}{e^{2y}}, y(1) = 0$

12)  $\frac{dy}{dx} = \frac{1+x^2}{y^2}, y(-1) = -\sqrt[3]{4}$

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**Question 4**

Consider the differential equation  $\frac{dy}{dx} = 2x - y$ .



- (a) On the axes provided, sketch a slope field for the given differential equation at the twelve points indicated, and sketch the solution curve that passes through the point  $(0, 1)$ . (Note: Use the axes provided in the pink test booklet.)
- (b) The solution curve that passes through the point  $(0, 1)$  has a local minimum at  $x = \ln\left(\frac{3}{2}\right)$ . What is the  $y$ -coordinate of this local minimum?
- (c) Let  $y = f(x)$  be the particular solution to the given differential equation with the initial condition  $f(0) = 1$ . Use Euler's method, starting at  $x = 0$  with two steps of equal size, to approximate  $f(-0.4)$ . Show the work that leads to your answer.
- (d) Find  $\frac{d^2y}{dx^2}$  in terms of  $x$  and  $y$ . Determine whether the approximation found in part (c) is less than or greater than  $f(-0.4)$ . Explain your reasoning.