CUET 2026 Mathematics May 26 Shift 2

Question Paper (Memory-Based) with Solutions

Conducted by National Testing Agency (NTA)

General Instructions

(i) The examination will be conducted in Computer-Based Test (CBT) mode.

(ii) Each question carries +5 marks for correct answer and -1 mark for wrong answer.

(iii) The total number of questions are 50.

(iv) Duration of the exam is 1 hour (60 minutes).

1. Evaluate:

$$\int (3x^2 + 4x - 5)\, dx$$

(A) $(x^3 + 2x^2 - 5x + C)$

(B) $(3x^3 + 4x^2 - 5x + C)$

(C) $(x^2 + 2x - 5 + C)$

(D) $(x^3 + 4x^2 - 5 + C)$

Correct Answer: (A) $(x^3 + 2x^2 - 5x + C)$

Solution:

Step 1: Understanding the Question:

In this problem, we are asked to find the indefinite integral of the algebraic polynomial function $3x^2 + 4x - 5$.

Evaluating an indefinite integral requires finding the general antiderivative of the given function.

We must apply standard rules of integration to each term and append a constant of integration C.

Step 2: Key Formula or Approach:

We use the fundamental rules of indefinite integration, which include:

1. The sum and difference rule: $\int (f(x) \pm g(x))\,dx = \int f(x)\,dx \pm \int g(x)\,dx$.
2. The constant multiple rule: $\int k \cdot f(x)\,dx = k \cdot \int f(x)\,dx$.
3. The power rule of integration: For any real number $n \neq -1$, we have $\int x^n\,dx = \frac{x^{n+1}}{n+1}$.
4. The integral of a constant: $\int k\,dx = kx$.

Step 3: Detailed Explanation:

Let us apply the sum and difference rule to decompose the given integral into three simpler integrals:

$$\int (3x^2 + 4x - 5)\,dx = \int 3x^2\,dx + \int 4x\,dx - \int 5\,dx$$

Now, we apply the constant multiple rule to factor out the numerical constants:

$$= 3\int x^2\,dx + 4\int x^1\,dx - 5\int 1\,dx$$

Next, we apply the power rule to integrate each individual term with respect to x:

For the first term, integrating x^2 yields:

$$3\left(\frac{x^{2+1}}{2+1}\right) = 3\left(\frac{x^3}{3}\right) = x^3$$

For the second term, integrating x^1 yields:

$$4\left(\frac{x^{1+1}}{1+1}\right) = 4\left(\frac{x^2}{2}\right) = 2x^2$$

For the third term, integrating the constant 5 yields:

$$5x$$

Now we combine all these results together and introduce the arbitrary constant of integration C:

$$\int (3x^2 + 4x - 5)\, dx = x^3 + 2x^2 - 5x + C$$

Let us verify this result by differentiating our antiderivative:

$$\frac{d}{dx}(x^3 + 2x^2 - 5x + C) = 3x^2 + 4x - 5$$

Since the derivative of our result matches the original integrand, the integration is verified.

Let us analyze why the other options are incorrect:

- Option (B) keeps the original coefficients instead of dividing them by the new powers.
- Option (C) represents differentiation rather than integration.
- Option (D) incorrectly performs the power rule on the second and third terms.

Step 4: Final Answer:

Therefore, the correct evaluation of the given integral matches Option (A).

Quick Tip: When integrating polynomials on competitive exams, quickly differentiate the options in your head.

Taking the derivative of $x^3 + 2x^2 - 5x + C$ instantly gives $3x^2 + 4x - 5$.

This reverse verification technique is often faster and less prone to calculation errors.

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2. If $y = e^{2x}$, then find $\frac{dy}{dx}$.

(A) $2e^{2x}$

(B) e^x

(C) $2xe^{2x}$

(D) $e^{2x} + 2$

Correct Answer: (A) $2e^{2x}$

Solution:

Step 1: Understanding the Question:

In this problem, we are given a composite exponential function $y = e^{2x}$ and asked to find its first derivative with respect to x.

This requires applying the rules of differentiation for exponential functions.

Step 2: Key Formula or Approach:

We will use the Chain Rule of differentiation.

If $y = f(u)$ and $u = g(x)$, then:

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

For an exponential function where $y = e^{kx}$ (with k being a constant), the derivative formula is:

$$\frac{d}{dx}(e^{kx}) = k \cdot e^{kx}$$

Step 3: Detailed Explanation:

Let us define our inner function as $u = 2x$ and the outer function as $y = e^u$.

First, we find the derivative of the inner function u with respect to x:

$$\frac{du}{dx} = \frac{d}{dx}(2x) = 2$$

Second, we find the derivative of the outer function y with respect to u:

$$\frac{dy}{du} = \frac{d}{du}(e^u) = e^u$$

Now, we apply the Chain Rule to find $\frac{dy}{dx}$ by multiplying these two derivatives:

$$\frac{dy}{dx} = e^u \cdot 2$$

Substituting back $u = 2x$ into the equation, we get:

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

Let us analyze why the other options are incorrect:

- Option (B) e^x is incorrect because it completely ignores both the coefficient 2 in the exponent and the chain rule.
- Option (C) $2xe^{2x}$ is incorrect because it mistakenly applies the power rule to the exponent instead of keeping the exponential term intact.
- Option (D) $e^{2x} + 2$ is incorrect because it adds the constant instead of multiplying by it.

Step 4: Final Answer:

Hence, the derivative of the given function is $2e^{2x}$, which corresponds to Option (A).

Quick Tip: For any exponential function of the form $y = e^{f(x)}$, its derivative is always the original function multiplied by the derivative of the exponent.

That is, $y' = f'(x) \cdot e^{f(x)}$.

This shortcut allows you to write down the answer instantly for any composite exponential function.

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3. Find the value of:

$$\int \frac{1}{x}\, dx$$

(A) $\log x + C$

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

(C) $x \log x + C$

(D) $e^x + C$

Correct Answer: (A) $\log x + C$

Solution:

Step 1: Understanding the Question:

The problem asks for the indefinite integral of the rational function $f(x) = \frac{1}{x}$ with respect to x.
We need to identify the antiderivative of this function from standard calculus integration formulas.

Step 2: Key Formula or Approach:

The power rule of integration states that:

$$\int x^n \, dx = \frac{x^{n+1}}{n+1} + C \quad (\text{for } n \neq -1)$$

When $n = -1$, the expression becomes $x^{-1} = \frac{1}{x}$.
Using the standard power rule here would lead to division by zero, which is undefined.
Therefore, we must use the specific logarithmic integration rule:

$$\int \frac{1}{x} \, dx = \ln |x| + C$$

In many contexts, particularly in standard textbooks and exams, $\ln x$ is represented simply as $\log x$.

Step 3: Detailed Explanation:

We are seeking a function $F(x)$ such that its derivative $F'(x) = \frac{1}{x}$.
From differential calculus, we know that the derivative of the natural logarithmic function is:

$$\frac{d}{dx}(\log x) = \frac{1}{x}$$

By the fundamental theorem of calculus, the inverse process of differentiation is integration.
Thus, the antiderivative of $\frac{1}{x}$ must be $\log x + C$, where C is the constant of integration.
Let us evaluate the other options:

- Option (B) is incorrect because $\frac{d}{dx}(\frac{1}{x^2}) = -2x^{-3}$, which is not $\frac{1}{x}$.
- Option (C) is incorrect because $\frac{d}{dx}(x \log x) = \log x + 1$ by using the product rule.
- Option (D) is incorrect because the derivative of e^x is e^x, not $\frac{1}{x}$.

Step 4: Final Answer:

Therefore, the correct evaluation of the integral is $\log x + C$, which corresponds to Option (A).

Quick Tip: Remember that the power rule of integration fails only when the exponent is -1.
In that special case, the integral always transitions to a logarithmic function.
This is one of the most frequently tested concepts in entrance exams.

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4. Find the solution of the differential equation:

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

(A) $y = x^3 + C$
(B) $y = 3x^3 + C$
(C) $y = x^2 + C$
(D) $y = 9x + C$

Correct Answer: (A) $y = x^3 + C$

Solution:

Step 1: Understanding the Question:

This problem asks us to solve a first-order ordinary differential equation of the form $\frac{dy}{dx} = f(x)$. To find the general solution, we must determine the function $y(x)$ whose derivative with respect to x is $3x^2$.

Step 2: Key Formula or Approach:

We can solve this first-order differential equation using the variable separable method.

We separate the variables y and x to opposite sides of the equation:

$$dy = f(x)\,dx$$

Then, we integrate both sides to obtain the general solution:

$$\int 1\,dy = \int f(x)\,dx$$

The integration of the right side will require the standard power rule of integration:

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$$

Step 3: Detailed Explanation:

Given the differential equation:

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

We separate the differentials by multiplying both sides by dx:

$$dy = 3x^2\,dx$$

Now, we integrate both sides of the equation:

$$\int dy = \int 3x^2\,dx$$

Integrating the left-hand side with respect to y:

$$\int dy = y$$

Integrating the right-hand side with respect to x:

$$\int 3x^2\,dx = 3 \cdot \frac{x^{2+1}}{2+1} + C = 3 \cdot \frac{x^3}{3} + C = x^3 + C$$

Combining both sides, we get the general solution:

$$y = x^3 + C$$

Let us examine the incorrect options:

- Option (B) $y = 3x^3 + C$ is incorrect because the coefficient 3 was not divided by the new exponent 3.
- Option (C) $y = x^2 + C$ is incorrect because it represents the derivative of the right-hand side, not the integral.
- Option (D) $y = 9x + C$ is incorrect because it is totally unrelated and does not represent the antiderivative.

Step 4: Final Answer:

The general solution of the given differential equation is $y = x^3 + C$, which matches Option (A).

Quick Tip: A simple differential equation of the form $\frac{dy}{dx} = f(x)$ is just an integration problem in disguise.

Simply integrate the right-hand side function directly to find y.

Do not forget to add the constant of integration C to represent the family of solutions.

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5. If

$$\frac{dy}{dx} = y$$

then which of the following is the correct solution?

(A) $y = Ce^x$

(B) $y = Cx$

(C) $y = x^2 + C$

(D) $y = \log x$

Correct Answer: (A) $y = Ce^x$

Solution:

Step 1: Understanding the Question:

The given equation is a first-order separable differential equation where the rate of change of y is directly proportional to y itself.

We need to find the function $y(x)$ that satisfies this relationship.

Step 2: Key Formula or Approach:

We use the method of separation of variables.

We rearrange the differential equation so that all terms containing y are on the left-hand side, and all terms containing x are on the right-hand side:

$$\frac{1}{y}\,dy = dx$$

Then, we integrate both sides using standard integration formulas:

$$\int \frac{1}{y}\,dy = \int dx$$

We use the logarithmic integration rule: $\int \frac{1}{y}\,dy = \ln|y|$.

Step 3: Detailed Explanation:

Starting with the separated differential equation:

$$\frac{dy}{y} = dx$$

Integrating both sides gives:

$$\int \frac{1}{y}\,dy = \int 1\,dx$$

Evaluating both integrals yields:

$$\ln|y| = x + C_1$$

where C_1 is the constant of integration.
To solve for y, we exponentiate both sides (using base e):

$$e^{\ln|y|} = e^{x+C_1}$$

$$|y| = e^x \cdot e^{C_1}$$

Since e^{C_1} is a constant, we can define a new arbitrary constant $C = \pm e^{C_1}$.
This simplifies the expression to:

$$y = Ce^x$$

Let us verify this solution by differentiating it:

$$\frac{dy}{dx} = \frac{d}{dx}(Ce^x) = Ce^x = y$$

This confirms that the differential equation is satisfied.
Let us analyze why other options are incorrect:
- Option (B) $y = Cx$ gives $\frac{dy}{dx} = C$, which is not equal to y.
- Option (C) $y = x^2 + C$ gives $\frac{dy}{dx} = 2x$, which is not equal to y.
- Option (D) $y = \log x$ gives $\frac{dy}{dx} = \frac{1}{x}$, which is not equal to y.

Step 4: Final Answer:

The general solution of the differential equation is $y = Ce^x$, which corresponds to Option (A).

Quick Tip: Any process where the growth rate of a quantity is proportional to its size yields an exponential function.
Thus, the equation $\frac{dy}{dx} = ky$ always has the standard solution $y = Ce^{kx}$.
Remembering this standard model saves valuable time during competitive exams.

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6. Which of the following functions has derivative equal to $\cos x$?

(A) $\sin x$
(B) $-\sin x$
(C) $\tan x$
(D) $\sec x$

Correct Answer: (A) $\sin x$

Solution:

Step 1: Understanding the Question:
The question asks us to identify which of the given trigonometric functions, when differentiated with respect to x, results in $\cos x$.
This is a fundamental question testing the basic derivatives of trigonometric functions.

Step 2: Key Formula or Approach:
We will recall and list the standard derivatives of common trigonometric functions:
1. $\frac{d}{dx}(\sin x) = \cos x$
2. $\frac{d}{dx}(\cos x) = -\sin x$
3. $\frac{d}{dx}(\tan x) = \sec^2 x$
4. $\frac{d}{dx}(\sec x) = \sec x \tan x$

Step 3: Detailed Explanation:
Let us test each option by differentiating it with respect to x:
- For Option (A):

$$\frac{d}{dx}(\sin x) = \cos x$$

This matches the requirement perfectly.

- For Option (B):

$$\frac{d}{dx}(-\sin x) = -\frac{d}{dx}(\sin x) = -\cos x$$

This has a negative sign, so it is incorrect.

- For Option (C):

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

This is not $\cos x$, so it is incorrect.

- For Option (D):

$$\frac{d}{dx}(\sec x) = \sec x \tan x$$

This is not $\cos x$, so it is incorrect.

Thus, the only function whose derivative is exactly $\cos x$ is $\sin x$.

Step 4: Final Answer:

The correct function is $\sin x$, which corresponds to Option (A).

Quick Tip: Be very careful with negative signs in trigonometric derivatives and integrals.

The derivative of $\sin x$ is $\cos x$, but the integral of $\sin x$ is $-\cos x$.

Memorizing these pairs in a tabular format prevents silly mistakes under exam pressure.

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7. Match the following:

List-I	Mathematical Expression	List-II	Resulting Value	Correct Match
(P)	$\det\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$	(I)	1	P → I
(Q)	$\int 2x\,dx$	(III)	x^2+C	Q → III
(R)	$\frac{d}{dx}(x^2)$	(II)	$2x$	R → II

(A) P–I, Q–III, R–II

(B) P–II, Q–I, R–III

(C) P–III, Q–II, R–I

(D) P–I, Q–II, R–III

Correct Answer: (A) P–I, Q–III, R–II

Solution:

Step 1: Understanding the Question:

This is a matching-type question where we need to evaluate three different mathematical expressions in List-I and match them with their corresponding results in List-II.

The expressions involve matrix determinants, indefinite integration, and differentiation.

Step 2: Key Formula or Approach:

We will evaluate each part independently using standard mathematical formulas:

1. For P, the determinant of a 2×2 matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is $ad - bc$.
2. For Q, the power rule of integration is $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$.
3. For R, the power rule of differentiation is $\frac{d}{dx}(x^n) = nx^{n-1}$.

Step 3: Detailed Explanation:

Let us solve each item in List-I step-by-step:

Evaluating P:

We need to find the determinant of the given identity matrix of order 2:

$$A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Using the determinant formula:

$$\det(A) = (1 \cdot 1) - (0 \cdot 0) = 1 - 0 = 1$$

So, (P) matches with (I).

Evaluating Q:

We need to evaluate the indefinite integral:

$$\int 2x \, dx$$

Using the constant multiple rule and power rule of integration:

$$\int 2x \, dx = 2 \int x^1 \, dx = 2\left(\frac{x^{1+1}}{1+1}\right) + C = 2\left(\frac{x^2}{2}\right) + C = x^2 + C$$

So, (Q) matches with (III).

Evaluating R:

We need to find the derivative of x^2 with respect to x:

$$\frac{d}{dx}(x^2)$$

Using the power rule of differentiation:

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

So, (R) matches with (II).

Combining our matches:

P matches with I.

Q matches with III.

R matches with II.

This gives the combination: P–I, Q–III, R–II.

Step 4: Final Answer:

The correct matching combination is Option (A).

Quick Tip: In matching questions, you often do not need to solve all parts.

Start with the easiest component. Here, matching P to I immediately eliminates Option (B) and Option (C).

Then, evaluating either Q or R will instantly lead to the unique correct option, saving precious exam time.

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8. If

$$A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$$

then find $|A|$.

(A) 5

(B) 8

(C) 11

(D) 13

Correct Answer: (A) 5

Solution:

Step 1: Understanding the Question:

The problem asks us to calculate the determinant of a given 2×2 square matrix A.

The determinant of a matrix is a scalar value that provides important algebraic information about the matrix.

Step 2: Key Formula or Approach:

For a general 2×2 matrix:

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

The determinant, denoted as $|A|$ or $\det(A)$, is calculated using the formula:

$$|A| = ad - bc$$

We multiply the diagonal elements and subtract the product of the off-diagonal elements.

Step 3: Detailed Explanation:

Let us identify the components of the given matrix $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$:

- $a = 2$ (element at first row, first column)
- $b = 1$ (element at first row, second column)
- $c = 3$ (element at second row, first column)
- $d = 4$ (element at second row, second column)

Now, apply these values to the determinant formula:

$$|A| = (2 \cdot 4) - (1 \cdot 3)$$

First, calculate the product of the principal diagonal elements:

$$2 \cdot 4 = 8$$

Next, calculate the product of the secondary diagonal elements:

$$1 \cdot 3 = 3$$

Now, subtract the secondary diagonal product from the principal diagonal product:

$$|A| = 8 - 3 = 5$$

Let us analyze why other options are incorrect:
- Option (B) 8 is incorrect because it is only the product of the principal diagonal, forgetting to subtract the other product.
- Option (C) 11 is incorrect because it adds the two products instead of subtracting them $(8 + 3 = 11)$.
- Option (D) 13 is incorrect because of an arithmetic calculation error.

Step 4: Final Answer:
The determinant of the matrix A is 5, which corresponds to Option (A).

Quick Tip: Always remember the sign convention when calculating determinants.
The principal diagonal product has a positive sign, while the secondary diagonal product is subtracted. Double-check simple multiplication and subtraction steps, as these are common areas for careless errors.

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9. Find the simple interest on Rs 5000 at 10% per annum for 2 years.

(A) Rs 500
(B) Rs 1000
(C) Rs 1500
(D) Rs 2000

Correct Answer: (B) Rs 1000

Solution:

Step 1: Understanding the Question:

This question is from business mathematics and commercial arithmetic.

We are required to compute the simple interest earned or paid on a given principal amount over a specified period at a flat annual rate of interest.

Step 2: Key Formula or Approach:

The standard formula for calculating simple interest (SI) is:

$$SI = \frac{P \cdot R \cdot T}{100}$$

where:

- P is the Principal amount (the initial sum of money).
- R is the Rate of interest per annum (expressed as a percentage).
- T is the Time period (expressed in years).

Step 3: Detailed Explanation:

Let us list the given parameters from the problem statement:

- Principal, $P = 5000$
- Rate of interest, $R = 10\%$ per annum
- Time period, $T = 2$ years

Now, substitute these values into the simple interest formula:

$$SI = \frac{5000 \cdot 10 \cdot 2}{100}$$

Let us perform the arithmetic steps:

1. First, multiply the numbers in the numerator:

$$5000 \cdot 10 \cdot 2 = 5000 \cdot 20 = 100000$$

2. Next, divide this product by 100:

$$SI = \frac{100000}{100} = 1000$$

Thus, the simple interest for 2 years is Rs 1000.

Let us review why other options are incorrect:

- Option (A) Rs 500 is incorrect because it represents the simple interest for only 1 year instead of 2 years.
- Option (C) Rs 1500 is incorrect because it represents the interest for 3 years.
- Option (D) Rs 2000 is incorrect because it represents the interest for 4 years.

Step 4: Final Answer:

The simple interest is Rs 1000, which matches Option (B).

Quick Tip: Simple interest grows linearly every year.

For quick mental calculation: 10% of 5000 is 500.

Since simple interest remains constant each year, the interest for 2 years is simply $500 \times 2 = 1000$.

Using this unitary method can help you solve simple interest problems without paper and pencil.

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10. A shopkeeper earns 20% profit on an article whose cost price is Rs 800. Find the selling price.

(A) Rs 920

(B) Rs 940

(C) Rs 960

(D) Rs 1000

Correct Answer: (C) Rs 960

Solution:

Step 1: Understanding the Question:

This is a commercial arithmetic problem dealing with cost price, selling price, and profit percentage.
The shopkeeper bought an item for a certain amount (Cost Price) and sold it to make a specified profit percentage.
We need to determine the final Selling Price.

Step 2: Key Formula or Approach:
We can solve this problem using either of the following two standard formulas:
Method 1: Calculate the absolute profit value and add it to the cost price:

$$\text{Profit} = \frac{\text{Profit Percentage}}{100} \cdot CP$$

$$SP = CP + \text{Profit}$$

Method 2: Use the direct multiplier formula for selling price:

$$SP = CP \cdot \left(1 + \frac{\text{Profit Percentage}}{100}\right)$$

where:
- CP is the Cost Price.
- SP is the Selling Price.

Step 3: Detailed Explanation:
Let us list the given parameters:
- Cost Price, $CP = 800$
- Profit Percentage $= 20\%$
Let us calculate using Method 1:
First, find the absolute profit earned by the shopkeeper:

$$\text{Profit} = \frac{20}{100} \cdot 800$$

Simplifying this calculation:

$$\text{Profit} = 0.20 \cdot 800 = 160$$

So, the shopkeeper earned a profit of Rs 160.

Now, calculate the Selling Price by adding the profit to the Cost Price:

$$SP = CP + \text{Profit}$$

$$SP = 800 + 160 = 960$$

Let us calculate using Method 2 to verify:

$$SP = 800 \cdot \left(1 + \frac{20}{100}\right)$$

$$SP = 800 \cdot (1 + 0.20)$$

$$SP = 800 \cdot 1.20 = 960$$

Both methods yield the same selling price of Rs 960.

Let us review why the other options are incorrect:

- Option (A) Rs 920 is incorrect because it corresponds to a profit percentage of only 15%.
- Option (B) Rs 940 is incorrect because it corresponds to a profit percentage of 17.5%.
- Option (D) Rs 1000 is incorrect because it corresponds to a profit percentage of 25%.

Step 4: Final Answer:

The selling price of the article is Rs 960, which corresponds to Option (C).

Quick Tip: For a 20% increase, you can directly multiply the original amount by 1.2.

Calculation: $800 \times 1.2 = 960$ can be done mentally in seconds.

This multiplier method is extremely useful for profit, loss, and percentage increase problems.