Fundamental theorem of calculus

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. $A(x) = \int_0^x (3t^2 - 1)\,dt$. Find $A'(x)$. [3 marks]

Apply the fundamental theorem directly.

Answer: $3x^2 - 1$

2. $B(x) = \int_1^{x^2} t^3\,dt$. Find $B'(x)$. [3 marks]

$(x^2)^3(2x) = 2x^7$.

Answer: $2x^7$

3. $C(x) = \int_0^{3x+1} \sin t\,dt$. Find $C'(x)$. [3 marks]

Endpoint derivative 3 multiplies the sine value.

Answer: $3\sin(3x + 1)$

4. $D(x) = \int_0^{1-x} e^t\,dt$. Find $D'(x)$. [3 marks]

The endpoint derivative is -1.

Answer: $-e^{1-x}$

5. $A(x) = \int_0^x (2t + 1)\,dt$. Evaluate A first, then differentiate to check the theorem. [3 marks]

$[t^2 + t]_0^x = x^2 + x$.

Differentiate and recover the integrand at x.

Answer: $A = x^2 + x$ and $A' = 2x + 1$

6. $F'(x) = f(x)$ and $F(2) - F(0) = 7$. Find $\int_0^2 f(x)\,dx$. [3 marks]

The fundamental theorem gives the stated endpoint difference.

Answer: 7