Work for problem 4(a)

\[ g(6) = 5 + \int_{6}^{6} f(t) \, dt = 5 \]

\[ g'(6) = f(6) = 3 \]

\[ g''(6) = f'(6) = 0 \]

Work for problem 4(b)

\[ g'(z) = \frac{d}{dz} \int_{6}^{z} f(t) \, dt = f(z) \]

*\( g \) decreases when \( f(z) < 0 \)

\(-3 < z < 0, \quad 12 < z < 15 \)
Work for problem 4(c)

\[ g''(x) = f''(x) < 0 \]

\[ f'(x) < 0 \text{ when } f(x) \text{ is decreasing} \]

\[ 6 < x < 15 \]

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Work for problem 4(d)

\[ 3 \times \left( \frac{-1+0}{2} \right) + 3 \times \left( \frac{0+1}{2} \right) + 3 \times \left( \frac{1+3}{2} \right) + 3 \times \left( \frac{3+1}{2} \right) + 3 \times \left( \frac{1+0}{2} \right) + 3 \times \left( \frac{0+1}{2} \right) \]

\[ = 3 \times 4 = 12 \]
NO CALCULATOR ALLOWED

CALCULUS AB
SECTION II, Part B
Time—45 minutes
Number of problems—3

No calculator is allowed for these problems.

![Graph of $f$]

Work for problem 4(a)

$g(6) = 5 + \int_6^6 f(t) \, dt = 0$

$g'(x) = f(x)$

$\therefore g'(6) = f(6) = 3$

$g''(6) = f'(6) = 0$

Work for problem 4(b)

$g'(x) = f(x)$ from $g'(x) = 0 + \frac{d}{dx} \left[ \int_6^x f(t) \, dt \right]$

$f(x) < 0$ on $-3 < t < 0$ and $12 < t < 15$

$\therefore g(x)$ is decreasing on $-3 < t < 0$ and $12 < t < 15$
Work for problem 4(c)

\[ g''(x) = f'(x) \]

\[ f'(x) \text{ is concave on } 6 < t < 15 \]

\[ g'(x) \text{ is concave down on } 6 < t < 15 \]

Work for problem 4(d)

\[ A \approx \frac{15}{12} \left( 1 - 1 \right) + (1)(2) + (3)(2) + (1)(2) + 1 - 1 \]

\[ \approx \frac{15}{12} (12) \approx 18 \text{ squared units} \]