AP® CALCULUS AB/CALCULUS BC
2018 SCORING GUIDELINES

Question 3

(a) $f(-5) = f(1) + \int_1^{-5} g(x)\,dx = f(1) - \int_{-5}^1 g(x)\,dx$
$= 3 - \left(-9 - \frac{3}{2} + 1\right) = 3 - \left(-\frac{19}{2}\right) = \frac{25}{2}$

2 : { 1 : integral; 1 : answer }

(b) $\int_1^6 g(x)\,dx = \int_1^3 g(x)\,dx + \int_3^6 g(x)\,dx$
$= \int_1^3 2\,dx + \int_3^6 2(x-4)^2\,dx$
$= 4 + \left[\frac{2}{3}(x-4)^3\right]_{x=3}^{x=6} = 4 + \frac{16}{3} - \left(-\frac{2}{3}\right) = 10$

3 : { 1 : split at $x = 3$; 1 : antiderivative of $2(x-4)^2$; 1 : answer }

(c) The graph of f is increasing and concave up on $0 < x < 1$ and $4 < x < 6$ because $f'(x) = g(x) > 0$ and $f'(x) = g(x)$ is increasing on those intervals.

2 : { 1 : intervals; 1 : reason }

(d) The graph of f has a point of inflection at $x = 4$ because $f'(x) = g(x)$ changes from decreasing to increasing at $x = 4$.

2 : { 1 : answer; 1 : reason }