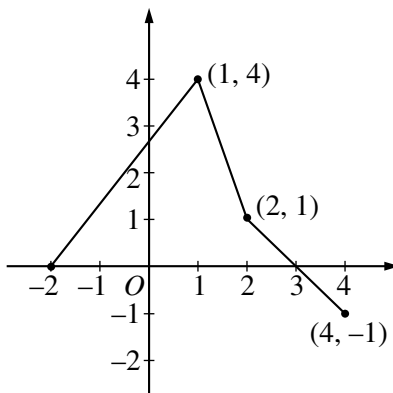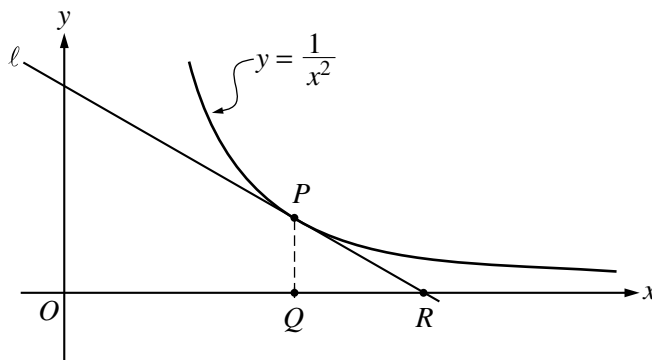# 1999 CALCULUS AB



5. The graph of the function $f$, consisting of three line segments, is given above. Let $g(x) = \int_1^x f(t)\,dt$.

(a) Compute $g(4)$ and $g(-2)$.

(b) Find the instantaneous rate of change of $g$, with respect to $x$, at $x = 1$.

(c) Find the absolute minimum value of $g$ on the closed interval $[-2, 4]$. Justify your answer.

(d) The second derivative of $g$ is not defined at $x = 1$ and $x = 2$. How many of these values are $x$-coordinates of points of inflection of the graph of $g$? Justify your answer.

6. In the figure above, line $\ell$ is tangent to the graph of $y = \dfrac{1}{x^2}$ at point $P$, with coordinates $\left(w, \dfrac{1}{w^2}\right)$, where $w > 0$. Point $Q$ has coordinates $(w, 0)$. Line $\ell$ crosses the $x$-axis at point $R$, with coordinates $(k, 0)$.

(a) Find the value of $k$ when $w = 3$.

(b) For all $w > 0$, find $k$ in terms of $w$.

(c) Suppose that $w$ is increasing at the constant rate of 7 units per second. When $w = 5$, what is the rate of change of $k$ with respect to time?

(d) Suppose that $w$ is increasing at the constant rate of 7 units per second. When $w = 5$, what is the rate of change of the area of ⏢ $PQR$ with respect to time? Determine whether the area is increasing or decreasing at this instant.

END OF EXAMINATION