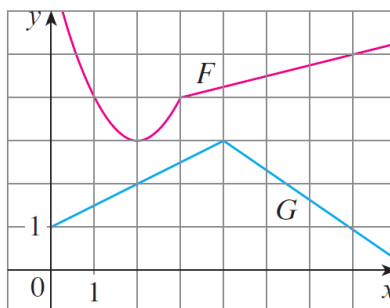


Exercise 50

Let $P(x) = F(x)G(x)$ and $Q(x) = F(x)/G(x)$, where F and G are the functions whose graphs are shown.

(a) Find $P'(2)$.

(b) Find $Q'(7)$.



Solution

Evaluate the derivative of $P(x)$ using the product rule.

$$P'(x) = F'(x)G(x) + F(x)G'(x)$$

Evaluate the derivative of $Q(x)$ using the quotient rule.

$$Q'(x) = \frac{F'(x)G(x) - G'(x)F(x)}{[G(x)]^2}$$

At $x = 2$, the slope of F is 0 and the slope of G is $1/2$: $F'(2) = 0$ and $G'(2) = 1/2$. Use this information to evaluate $P'(2)$.

$$P'(2) = F'(2)G(2) + F(2)G'(2) = (0)(2) + (3)\left(\frac{1}{2}\right) = \frac{3}{2}$$

At $x = 7$, the slope of F is $1/4$ and the slope of G is $-2/3$: $F'(7) = 1/4$ and $G'(7) = -2/3$. Use this information to evaluate $Q'(7)$.

$$Q'(7) = \frac{F'(7)G(7) - G'(7)F(7)}{[G(7)]^2} = \frac{\left(\frac{1}{4}\right)(1) - \left(-\frac{2}{3}\right)(5)}{1^2} = \frac{43}{12}$$