

# SATPREP

## Calculus

1. Let  $g(x) = \frac{\ln x}{x^2}$ , for  $x > 0$ .
  - (a) Use the quotient rule to show that  $g'(x) = \frac{1 - 2 \ln x}{x^3}$ .
  - (b) The graph of  $g$  has a maximum point at A. Find the  $x$ -coordinate of A.
  
2. Let  $h(x) = \frac{6x}{\cos x}$ . Find  $h'(0)$ .
  
3. Let  $f(x) = e^{-3x}$  and  $g(x) = \sin\left(x - \frac{\pi}{3}\right)$ .
  - (a) Write down
    - (i)  $f'(x)$ ;
    - (ii)  $g'(x)$ .
  - (b) Let  $h(x) = e^{-3x} \sin\left(x - \frac{\pi}{3}\right)$ . Find the exact value of  $h'\left(\frac{\pi}{3}\right)$ .
  
4. A gradient function is given by  $\frac{dy}{dx} = 10e^{2x} - 5$ . When  $x = 0$ ,  $y = 8$ . Find the value of  $y$  when  $x = 1$ .
  
5. Let  $g(x) = 2x \sin x$ .
  - (a) Find  $g'(x)$ .
  - (b) Find the gradient of the graph of  $g$  at  $x = \pi$ .
  
6. Let  $f(x) = e^x \cos x$ . Find the gradient of the normal to the curve of  $f$  at  $x = \pi$ .
  
7. The graph of  $y = \sqrt{x}$  between  $x = 0$  and  $x = a$  is rotated  $360^\circ$  about the  $x$ -axis. The volume of the solid formed is  $32\pi$ . Find the value of  $a$ .