BHASKAR CLASSES PVT LTD

Application of Derivatives

1. If x *and* y are the sides of two squares such that $y = x - x^2$. Find the change of the area of second square with respect to the area of the first square.
2. The total revenue received from the sale of x units of a product is given by $R(x) = 13x^2 + 26x + 15$. Find the marginal revenue when $x = 7$.
3. A stone is dropped into a quiet lake and waves move in circles at a speed of 4cm/sec. At the instant when the radius of the circular wave is 10cm, how fast is the enclosed are increasing?
4. A particle moves along the curve $y = x^2 + 2x$. At what point(s) on the curve are the x and y coordinates of the particle changing at the same rate?
5. Find the intervals in whether it is decreasing or increasing for $f(x) = 10 - 6x - 2x^2$.
6. Find the intervals in whether it is decreasing or increasing for $f(x) = 2x^3 + 9x^2 + 12x + 20$.
7. Find the intervals in whether it is decreasing or increasing for $f(x) = 2x^3 - 15x^2 + 36x + 1$.
8. Find the intervals in whether it is decreasing or increasing for $f(x) = x^3 - 6x^2 + 9x + 15$.
9. Prove that the following functions are increasing on R:
   a. $f(x) = 3x^5 + 40x^3 + 240x$
   b. $f(x) = 4x^3 - 18x^2 + 27x - 27$
10. Show that $f(x) = \tan^{-1}(\sin x + \cos x)$ is a decreasing function on the interval $\pi/4\,, \pi/2$.
11. Find all the points of local maxima and minima of the function $f(x) = x^3 - 6x^2 + 9x - 8$.
12. Find all the points of local maxima and minima and the corresponding maximum and minimum values of the function $f(x) = -\frac{3}{4}x^4 - 8x^3 - \frac{45}{2}x^2 + 105$.
13. Show that $\frac{\log x}{x}$ has a maximum value at $x = e$.
14. Prove that $f(x) = \sin x + \sqrt{3}\cos x$ has a maximum value at $x = \frac{\pi}{6}$.
15. Find the absolute maximum and minimum values of a function f given by $f(x) = 2x^3 - 15x^2 + 36x + 1$ on the interval [1, 5].