Application of Derivatives

Q.No.1:
The real number k for which the equation, $2x^3 + 3x + k = 0$ has two distinct real roots in [0, 1]

JEE 2013

A. lies between 1 and 2.
B. lies between 2 and 3.
C. lies between −1 and 0.
D. does not exist.

Q.No.2: The normal to the curve, $x^2 + 2xy - 3y^2 = 0$, at (1, 1) : **JEE 2015**

A. does not meet the curve again
B. meets the curve again in the second quadrant
C. meets the curve again in the third quadrant
D. meets the curve again in the fourth quadrant

Q.No.3:
Let $f(x)$ be a polynomial of degree four having extreme values at $x = 1$ and $x = 2$. If $\lim\limits_{x \to 0} \left[1 + \frac{f(x)}{x^2}\right] = 3$, then $f(2)$ is equal to:

JEE 2015

A. − 8
B. − 4
C. 0
D. 4

Q.No.4: A wire of length 2 units is cut into two parts which are bent respectively to form a square of side = x units and a circle of radius = r units. If the sum of the areas of the square and the circle so formed is minimum, then:

A. $(4 - \pi)\, x = \pi r$ **JEE 2016**

B. $x = 2r$

C. $2x = r$

D. $2x = (\pi + 4)r$

Q.No.5: Consider $f(x) = \tan^{-1}\left(\sqrt{\frac{1+\sin x}{1-\sin x}}\right),\ x \in \left(0, \frac{\pi}{2}\right)$. A normal to $y = f(x)$ at $= \frac{\pi}{6}$ also passes through the point : **JEE 2016**

A. $\left(0,\ \frac{2\pi}{3}\right)$

B. $\left(\frac{\pi}{6},\ 0\right)$

C. $\left(\frac{\pi}{4},\ 0\right)$

D. (0, 0)

Q.No.6: Twenty meters of wire is available for fencing off a flower-bed in the form of a circular sector. Then the maximum area (in sq. m) of the flower-bed, is : **JEE 2017**

A. 12.5

B. 10

C. 25

D. 30

Q.No.7: The normal to the curve $y(x - 2)(x - 3) = x + 6$ at the point where the curve intersects the y-axis passes through the point : **JEE 2017**

A. $\left(-\frac{1}{2}, -\frac{1}{2}\right)$

B. $\left(\frac{1}{2},\ \frac{1}{2}\right)$

C. $\left(\frac{1}{2}, -\frac{1}{3}\right)$

D. $\left(\frac{1}{2},\ \frac{1}{3}\right)$

Q.No.8: The radius of a circle, having minimum area, which touches the curve $y = 4 - x^2$ and the lines, $y = |x|$ is **JEE 2017**

A. $2\left(\sqrt{2}+1\right)$

B. $2\left(\sqrt{2}-1\right)$

C. $4\left(\sqrt{2}-1\right)$

D. $4\left(\sqrt{2}+1\right)$

Q.No.9: If the curves $y^2 = 6x$, $9x^2 + by^2 = 16$ intersect each other at right angles, then the value of b is : **JEE 2018**

A. 4

B. $\frac{9}{2}$

C. 6

D. $\frac{7}{2}$

Q.No.10: Let $f(x) = x^2 + \frac{1}{x^2}$ and $g(x) = x - \frac{1}{x}$, $x \in \mathbf{R} - \{-1, 0, 1\}$. If $h(x) = \frac{f(x)}{g(x)}$, then the local minimum value of $h(x)$ is : **JEE 2018**

A. $-2\sqrt{2}$

B. $2\sqrt{2}$

C. 3

D. –3