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TANGENTS AND NORMALS

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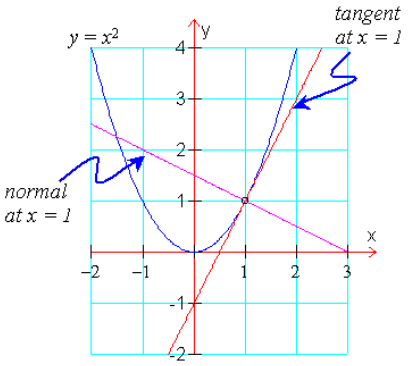
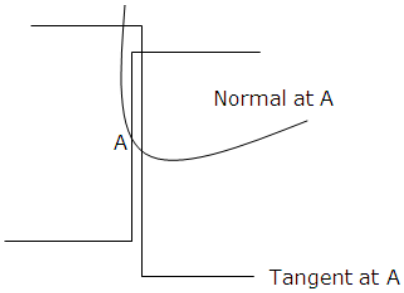
Slope of Tangent and Normal



Slope of a tangent

Slope of a tangent to the curve y = f(x) is given by dy / dx



Slope of a normal

Slope of thenormal to the curve y = f(x) is given by -1 / (dy/dx)

Equation of Tangent and Normal

Equation of tangent at (x_0, y_0)

Equation of the tangent at the point (x_0, y_0) is given by

$$(y - y_0) = dy / dx (x - x_0)$$

OR

$$(y - y_0) = f'(x) (x - x_0)$$

Equation of normal at (x_0, y_0)

Equation of the normal at the point (x_0, y_0) is given by

$$(y – y_0) = -1 / (dy / dx) (x - x_0)$$

OR

$$(y - y_0) = [-1 / f'(x_0)] (x - x_0)$$

Condition for perpendicularity and parallelism

- If the lines are parallel then the slopes are equal
- If the lines are perpendicular the product of their slopes is -1
- If the tangent is parallel to x-axis then dy / dx = 0
- If the tangent is parallel to y-axis then dy / dx = 1 / 0
- Slope of the line segment joining two points (x_1, y_1) and (x_2, y_2) is given by $(y_2 - y_1) / (x_2 - x_1)$

The following examples will help us to understand the concept more thoroughly:

Example 1: Find the point on the curve $y = x^3 - 11x + 5$ at which tangent is $y = x - 11$

Solution: Slope of the tangent to the curve, $dy / dx = 3x^2 - 11$

Since $y = x - 11$, $dy / dx = 1$

$3x^2 – 11 = 1$

$x^2 = 4$

$x = 2$

When $x = 2$, $y = 23 – 11 \times 2 + 5 = 8 – 22 + 5 = -9$, so the point is $(2, -9)$

Example 2: Find the equation of the tangent line to the curve $y = x^2 - 2x + 7$ which is parallel to the line $2x – y + 9 = 0$

Solution: Slope of the tangent = $2x - 2$

Slope of the line = 2

Since they are parallel, $2x – 2 = 2$

$x = 2$

When $x = 2$, $y = 4 – 4 + 7 = 7$

So the point is $(2, 7)$

Equation of the tangent is, $y – 7 = 2 (x - 2)$

$$y = 2x + 3$$

Now try it yourself! Should you still need any help,click here to schedule live online session with e Tutor!

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Reference Links:

- http://en.wikipedia.org/wiki/Slope
- http://en.wikipedia.org/wiki/Tangent
- http://ref.subwiki.org/wiki/Normal_(mathematics)
- http://en.wikipedia.org/wiki/Equation
- http://en.wikipedia.org/wiki/Parallel_(geometry)
- http://en.wikipedia.org/wiki/Perpendicular

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