Tanget and Normal

1 Tangent And Normal

1.1 Introuction

Let equation of a curve be $y = f(x)$.
And its first derevative be $\dfrac{dy}{dx} = \dfrac{d}{dx}(f(x))$.
Slope of Tangent:

- at point P: $\dfrac{dy}{dx}$
- parallel to x-axis: $\dfrac{dy}{dx}(x_1, y_1) = 0$
- parallel to y-axis: $\dfrac{dy}{dx}(x_1, y_1) = \infty$

Slope of Normal: at point P $= \dfrac{-1}{\frac{dy}{dx}}$ or $\dfrac{-dx}{dy}$

1.2 Equations

$y - y_1 = m(x - x_1)$ where (x_1, y_1) is the point of tangent and normal.
For Tangent: $y - y_1 = \left(\dfrac{dy}{dx}\right)_P (x - x_1)$
For Normal: $y - y_1 = \dfrac{-1}{\left(\frac{dy}{dx}\right)_P}(x - x_1)$

2 Angle between two curves

2.1 Angle of Intersection

let $C_1 = y = f(x)$ and $C_2 = y = (x)$.
PT_1 = tangent to C_1 and PT_2 = tangent to C_2.

Then,
$m_1 = \tan\psi_1 =$ slope of tangent of $y = f(x)$ at $P = \left(\dfrac{dy}{dx}\right)_{C_1}$
$m_2 = \tan\psi_2 =$ slope of tangent of $y = g(x)$ at $P = \left(\dfrac{dy}{dx}\right)_{C_2}$
$\phi = \psi_1 - \psi_2$
or, $\tan\phi = \dfrac{\tan\psi_1 - \tan\psi_2}{1 - \tan\psi_1 \tan\psi_2}$
or, $\tan\phi = \dfrac{\left(\frac{dy}{dx}\right)_{C_1} - \left(\frac{dy}{dx}\right)_{C_2}}{1 + \left(\frac{dy}{dx}\right)_{C_1}\left(\frac{dy}{dx}\right)_{C_2}}$
Note: The other angle between tangents $= 180° - \theta$

2.2 Orthogonal Curves

3 Subtangent and Subnormal

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