ASSIGNMENT: DIFFERENTIATION

Smart Mathematics
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Q.1. If $y = \log\{x + \sqrt{x^2 + a^2}\}$, then prove $(x^2 + a^2)y_2 + xy_1 = 0$.

Q.2. If $y = (x + \sqrt{1 + x^2})^n$, then show $(1 + x^2)\, y_2 + xy_1 - x^2y = 0$.

Q.3. If $y = x \log\left(\frac{x}{a+bx}\right)$, then show that $x^3 \frac{d^2y}{dx^2} = \left(x\frac{dy}{dx} - y\right)^2$.

Q.4. If $x = \tan\left(\frac{1}{a}\log y\right)$, then show that $(1 + x^2)\, y_2 + (2x - a)\, y_1 = 0$.

Q.5. If $(x - a)^2 + (y - b)^2 = c^2$ then show $\frac{(1+ {y_1}^2)^{\frac{3}{2}}}{y_2} = -c$

Q.6 If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, then show $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$.

Q.7 If x = sint ; y = sinpt then show that $(1 - x^2)y_2 - xy_1 + p^2y = 0$.

Q.8 If $y = tan^{-1}\left(\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right)$ then show $\frac{d^2y}{dx^2} = 0$

Q.9 If $x^{16}y^9 = (x^2 + y)^{17}$, then show that $\frac{dy}{dx} = \frac{2y}{x}$

Q.10 Find $\frac{dy}{dx}$ for $y = sin^{-1}\left[\frac{6x - 4\sqrt{1-4x^2}}{5}\right]$

Q.11 Differentiate $tan^{-1}\left(\frac{\sqrt{1+x^2} - 1}{x}\right)$ w.r.t. $sin^{-1}\left(2x\sqrt{1-x^2}\right)$.

Q.12 If $y = a^x + x^a + x^x + a^a$ then find $\frac{dy}{dx}$.

Q.13 If $y = \log_a x + \log_x a + \log_a a + \log_x x$ then find $\frac{dy}{dx}$.

Q.14 If x = 2cosθ – cos2θ and y = 2sinθ – sin2θ, then show that $\frac{dy}{dx} = \tan\left(\frac{3\theta}{2}\right)$.

Q.15 If $y = tan^{-1}\left(\frac{5\,ax}{a^2 - 6x^2}\right)$ find $\frac{dy}{dx}$.

Q.16 If $x^y + y^x = a^a$ find $\frac{dy}{dx}$.

Q.17 If $y = \sin(m\, sin^{-1}x)$ then show $(1 - x^2)y_2 - xy_1 + m^2y = 0$

Q.18 Prove that $\frac{d}{dx}\left[\frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2} sin^{-1}\frac{x}{a}\right] = \sqrt{a^2 - x^2}$

Q.19 If $y = sin^{-1}\left[\frac{2^{x+1}.3^x}{1+(36)^x}\right]$ find $\frac{dy}{dx}$.

Q.20 If $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \ldots\ldots\ldots\infty}}}$ show $\frac{dy}{dx} = \frac{\sin x}{1 - 2y}$