Math 101 Quiz 4 27/10/2013

Ex1 Find the derivative of

a) $y = e^{\cos^2(\pi t - 1)}$, b) $y = \cos^4(\sec^2 3t)$

Ex2 Find the second derivative of $y = \sin(x^2 e^x)$

Solution

Ex1. a) $y' = \frac{d}{dt}\left[\cos^2(\pi t - 1)\right] . e^{\cos^2(\pi t - 1)}$

$= -2\pi \sin(\pi t - 1) \cos(\pi t - 1) . e^{\cos^2(\pi t - 1)}$

$= -\pi \sin(2\pi t - 2)\, e^{\cos^2(\pi t - 1)} = \sin(2 - 2\pi t)\, e^{\cos^2(\pi t - 1)}$

b) $y' = -4 \frac{d}{dt}(\sec^2 3t) \sin(\sec^2 3t) \cos^3(\sec^2 3t)$

$= -24 \sec 3t \tan 3t \sec 3t \sin(\sec^2 3t) \cos^3(\sec^2 3t)$

$= -24 \sec^2 3t . \tan 3t . \sin(\sec^2 3t) . \cos^3(\sec^2 3t)$

Ex2 $y' = \frac{d}{dx}(x^2 e^x) . \cos(x^2 e^x) = (2x e^x + x^2 e^x) \cos(x^2 e^x)$

$= (2 + x) x e^x \cos(x^2 e^x)$.

$y'' = x e^x \cos(x^2 e^x) + (2 + x) e^x \cos(x^2 e^x) + (2 + x) x e^x \cos(x^2 e^x)$

$+ (2 + x) x e^x \left[-(2 + x) x e^x \sin(x^2 e^x)\right]$

$= (x^2 + 4x + 2) e^x \cos(x^2 e^x) - (2 + x)^2 x^2 e^{2x} \sin(x^2 e^x)$