Answer on Question #62322 – Math – Calculus

Question

If $y = e^{ax}\cos(3x)\sin(2x)$

find $\frac{dy}{dx}$.

Solution

We shall use the following differentiation rules:

1) The product rule:
   $(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$;
2) The chain rule:
   $(f(g(x))' = f'(g(x)) \cdot g'(x)$
3) The constant factor rule:
   $(af(x))' = a \cdot f'(x)$.

We shall use the well-known table derivatives:

$(e^x)' = e^x$, $(\cos x)' = -\sin x$, $(\sin x)' = \cos x$, $x' = 1$.

Then

$$y = e^{ax}\cos 3x \sin 2x$$
$$\frac{dy}{dx} = \left(e^{ax}\cos 3x\right)'\sin 2x + e^{ax}\cos 3x\left(\sin 2x\right)' = \left(ae^{ax}\cos 3x - 3e^{ax}\sin 3x\right)\sin 2x + 2e^{ax}\cos 3x\cdot\cos 2x =$$
$$= e^{ax}(a\cos 3x\sin 2x - 3\sin 3x\sin 2x + 2\cos 3x\cos 2x)$$

Answer: $\frac{dy}{dx} = e^{ax}(\mathrm{a}\cdot\cos 3x\sin 2x - 3\sin 3x\sin 2x + 2\cos 3x\cos 2x)$.