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151=tnynlo13

(1) $y = e^{2x} + x$

$u = x^2 + x$

$\frac{du}{dx} = 2x + 1$

$y = e^x$

$\frac{dy}{dx} = e^u$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= e^u \times 2x + 1$

$= 2x + 1e^u \qquad u = x^2 + x$

$\frac{dy}{dx} = 2x + 1e^{x^2+x}$

$\frac{d^2y}{dx^2} = 2e^{x^2+x} + (2x+1)(2x+1)e^{x^2+x}$

$= 2e^{x^2+x} + 4x^2 + 4x + 1e^{x^2+x}$

$= 2e^{x^2+x} + 4x^2 + 4x + 1e^{x^2+x}$

$y'' = \frac{d^2y}{dx^2} \quad y' = \frac{dy}{dx} \quad y = e^{x^2+x}$

$y'' = y'(2x+1) + 2y$

$y'' = 2e^{x^2+x} + 4x^2 + 4x + 1e^{x^2+x}$

$y' = (2x+1) - (2x+1)(2x+1)e^{x^2+x}$

$= 4x^2 + 4x + 1e^{x^2+x}$

$2y = 2e^{x^2+x}$

$y' = (2x+1) + 2y = 2e^{x^2+x} + 4x^2 + 4x + 1e^{x^2+x}$

$= 2e^{x^2+x} + 4x^2 + 4x + 1e^{x^2+x}$

$\underbrace{y''}_{kl_1} = \underbrace{y'(2x+1)}_{kl_2} + \underbrace{2y}_{kl_3}$

$y = y''$ $\qquad V = 1$

$u^n = y^{n+2}$ $\qquad V = U$

$= y^{n+2} \cdot 1 + 0$

$u = y'$

$u^n = y^{n+1}$

$u^{n-1} = y^n$

$= y^{n+1}(2x+1) + n(y^n) \cdot 2 + 0$

$= y^{n+1}(2x+1) + 2n(y^n)$

kl_3

$u = y \qquad v = 1$

$u^n = y^n \qquad v = 0$

$= 2(y^n \cancel{+1}) + 0)$

$kl_1 = kl_2 + kl_3$

$y^{n+1} = y^{n+1}(2x+1) + 2n(y^n) + 2y^n$

$= y^{n+1}(2x+1) + 2(n+1)y^n$

(2) $y = x^3 e^{4x} \qquad y^5$

$u = e^{4x} \quad v = x^3$

$y^5 = u^5 v + 5u^4 v^1 + 10u^2 v^4 + 10u^2 v^3 + 5u^1 v^4 + uv^5$

$= 4^5 e^{4x} \cdot x^3 + 5(4^4 e^{4x} \cdot 3x^2) + 10(4^3 e^{4x} \cdot 6x) + 5(4^2 e^{4x} \cdot 6) + 0$

$= 1024 e^{4x} x^3 + 1280 e^{4x} 3x^2 + 640 e^{4x} \cdot 6x + 80 e^{4x} \cdot 6$

$= 1024 e^{4x} + 3840 x^2 + 3840 e^{4x} x + 480 e^{4x}$

(3) $x^2 \frac{dy^2}{dx^2} + x\frac{dy}{dx} + y = 0$

$x^2 y^4 + xy^1 + y = 0$

$w_1 \qquad w_2 \qquad w_3$

$kl_1 \cancel{+} kl_2 + kl_3 = 0$

For w_1

$u = y^4 \qquad v = x^2$

$u^n = y^{n+2} \qquad v^1 = 2x$

$u^{n-1} = y^{n+1} \qquad v^4 = 2$

$y^{(n+2)}(x^2) + n(y^{n+1})2x + \frac{n(n-1)y^n \cdot x}{2!} = 0$

$= x^2 y(n+2) + 2nx(y^{n+1}) + n(n-1)y^n$.

for w_2

$u = y_1 \quad v = x$

$u^n = y^{n+1} \quad v = 1$

$u^{n-1} = y^n \quad u^n = 0$

$y^{n+1} \cdot x + ny^n + 0$

for w_3

$u = y \quad v = 1$

$u^n = y^n \quad v' = 0$

$y^n \cdot 1$

$w_1 + w_2 + w_3 = 0$

$x^2 y^{n+2} + 2nxy^{n+1} + (n^2 - n)y^n + xy^{n+1} + ny^n + y^n$

$xy^{n+2} + 2nxy^{n+1} + xy^{n+1} + n^2 y^n - \cancel{ny^n} + \cancel{ny^n} + y^n$

$x^2 y^{n+2} + 2n + 1 (xy^{n+1}) + (n^2+1)y^n$