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Exercice 1 :
Montrez que $z(x,y) = 4e^{-3x}cos(3y)$ est solution du probléme de valeurs aux limites :

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0, \quad z(x,\pi/2) = 0, \quad z(x,0) = 4e^{-3x}$$

Exercice 2 :
(a) Montrer que $v(x,y) = xF(2x+y)$ est une solution générale de

$$x\frac{\partial v}{\partial x} - 2x\frac{\partial v}{\partial y} = v.$$

(b) Trouver une solution particulière satisfaisant $v(1,y) = y^2$.

Exercice 3 :
a) Résoudre $x\dfrac{\partial^2 z}{\partial x \partial y} + \dfrac{\partial z}{\partial y} = 0$.
b) Trouver la solution particulière pour laquelle $z(x,0) = x^5 + x - \frac{68}{x}$, $z(2,y) = 3y^2$.

Exercice 4 : Intégrer les équations différentielles :
a) $xy' - y = 0$
b) $y" - 3y' + 2y = 0$
c) $y" - 2y' + y = 0$
d) $y" + 4y = 0$;

Exercice 5 :
Résoudre par la méthode de séparation des variables :
a) $3\dfrac{\partial u}{\partial x} + 2\dfrac{\partial u}{\partial y} = 0, \quad u(x,0) = 4e^{-x}$
b) $\dfrac{\partial u}{\partial x} = 2\dfrac{\partial u}{\partial y} + u, \quad u(x,0) = 3e^{-5x} + 2e^{-3x}$
c) $\dfrac{\partial u}{\partial t} = 4\dfrac{\partial^2 u}{\partial x^2}, \quad u(0,t) = 0, \quad u(\pi,t) = 0, \quad u(x,0) = 2sin(3x) - 4sin(5x)$
d) $\dfrac{\partial u}{\partial t} = 3\dfrac{\partial u}{\partial x}, \quad u(x,0) = 8e^{-2x}$
e) $\dfrac{\partial^2 u}{\partial t^2} = 16\dfrac{\partial^2 u}{\partial x^2}, \quad u(0,t) = 0, \quad u(2,t) = 0, \quad u(x,0) = 6sin(\pi x) - 3sin(4\pi x)$, $u_t(x,0) = 0$
f) $\dfrac{\partial u}{\partial t} = 4\dfrac{\partial^2 u}{\partial x^2}$, $u_x(0,t) = 0$, $u(2,t) = 0, \quad u(x,0) = 8cos(\dfrac{3\pi x}{4}) - 6\cos(\dfrac{9\pi x}{4})$