Guía de Ejercicios # 21

1.- Para cada una de las ecuaciones diferenciales lineales determine la solución general de la ecuación diferencial dada.

(1) $\frac{dy}{dx} = 5y$

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

(3) $3\frac{dy}{dx} + 12y = 4$

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

(5) $\frac{dy}{dx} + y = e^{3x}$

(6) $\frac{dy}{dx} = y + e^{x}$

(7) $y' + 3x^2y = x^2$

(8) $y' + 2xy = x^3$

(9) $x^2y' + xy = 1$

(10) $y' = 2y + x^2 + 5$

(11) $(x + 4y^2)dy + 2ydx = 0$

(12) $\frac{dy}{dx} = x + y$

(13) $xdy = (x\operatorname{sen}(x) - y)dx$

(14) $(1 + e^x)\frac{dy}{dx} + e^x y = 0$

(15) $(1 - x^3)\frac{dy}{dx} = 3x^2y$

(16) $\cos(x)\frac{dy}{dx} + y\operatorname{sen}(x) = 1$

(17) $\frac{dy}{dx} + y\cot(x) = 2\cos(x)$

(18) $x\frac{dy}{dx} + 4y = x^3 - x$

(19) $(x - 1)y' - xy = x + x^2$

(20) $x^2y' + x(x + 2)y = e^x$

(21) $xy' + (1 + x)y = e^{-x}\operatorname{sen}(2x)$

(22) $ydx + (xy + 2x - ye^y)dy = 0$

(23) $dx = (3e^y - 2x)dy$

(24) $x\frac{dy}{dx} + (3x + 1)y = e^{3x}$

(25) $(x+1)\frac{dy}{dx} + (x+2)y = 2xe^{-x}$

(26) $ydx + 4(x + y^2)dy = 0$

(27) $xy' + 2y = e^x + \ln(x)$

(28) $ydx + (x + 2xy^2 - 2y)dy = 0$

(29) $ydx = (ye^y - 2x)dy$

(30) $\frac{dr}{d\theta} + r\sec(\theta) = \cos(\theta)$

(31) $\frac{dP}{dt} + 2tP = P + 4t - 2$

(32) $(x + 2)^2\frac{dy}{dx} = 5 - 8y - 4xy$

(33) $(x^2 - 1)\frac{dy}{dx} + 2y = (x + 1)^2$

(34) $(1 - \cos(x))dy + (2y\operatorname{sen}(x) - \tan(x))dx = 0$

(35) $(1 + x^2)dy + (xy + x^3 + x)dx = 0$

(36) $\cos^2(x)\operatorname{sen}(x)dy + (y\cos^3(x) - 1)dx = 0$

(37) $(x^2 + x)dy = (x^2 + 3xy + 3y)dx$

2.- Resuelva la ecuación diferencial respectiva, sujeta a la condición inicial indicada.

(a) $\frac{dy}{dx} + 5y = 20$; $y(0) = 2$

(b) $y' = 2y + x(e^{3x} - e^{2x})$; $y(0) = 2$

(c) $L\frac{di}{dt} + Ri = E$; L, R y E constantes, $i(0) = i_0$

(d) $y\frac{dx}{dy} - x = 2y^2$; $y(1) = 5$

(e) $y' + \tan(x)y = \cos^2(x)$; $y(0) = -1$

(f) $\frac{dQ}{dx} = 5x^4Q$; $Q(0) = -7$

(g) $\frac{dT}{dt} = k(T - 50)$; k constante, $T(0) = 200$

3.- Determine si la ecuación diferencial es exacta. Si lo es resuélvala.

(1) $(2x - 1)dx + (3y + 7)dy = 0$

(2) $(2x+y)dx-(x+6y)dy=0$

(3) $(5x+4y)dx+(4x-8y^3)dy=0$

(4) $(\operatorname{sen}(y)-y\operatorname{sen}(x))dx+(\cos(x)+x\cos(x)-y)dy=0$

(5) $(2y^2x-3)dx+(2yx^2+4)dy=0$

(6) $\left(2y-\dfrac{1}{x}+\cos(3x)\right)\dfrac{dy}{dx}+\dfrac{y}{x^2}-4x^3+3y\operatorname{sen}(3x)=0$

(7) $(x+y)(x-y)dx+x(x-2y)dy=0$

(8) $\left(1+\ln(x)+\dfrac{y}{x}\right)dx=(1-\ln(x))dy$

(9) $(y^3-y^2\operatorname{sen}(x)-x)dx+(3xy^2+2y\cos(x))dy=0$

(10) $(x^3+y^3)dx+3xy^2dy=0$

(11) $(y\ln(y)-e^{-xy})dx+\left(\dfrac{1}{y}+x\ln(y)\right)dy$

(12) $\dfrac{2x}{y}dx-\dfrac{x^2}{y^2}dy=0$

(13) $x\frac{dy}{dx}=2xe^x-y+6x^2$

(14) $(3x^2y+e^y)dx+(x^3+xe^y-2y)dy=0$

(15) $\left(1-\dfrac{3}{x}+y\right)dx+\left(1-\dfrac{3}{y}+x\right)dy=0$

(16) $\left(x^2y^3-\dfrac{1}{1+9x^2}\right)\dfrac{dx}{dy}+x^3y^2=0$

(17) $(5y-2x)y'-2y=0$

(18) $(\tan(x)-\operatorname{sen}(x)\operatorname{sen}(y))dx+\cos(x)\cos(y)dy=0$

(19) $(3x\cos(3x)+\operatorname{sen}(3x)-3)dx+(2y+5)dy=0$

(20) $(1-2x^2-2y)\dfrac{dy}{dx}=4x^3+4xy$

(21) $(2y\operatorname{sen}(x)\cos(x)-y-2y^2e^{xy^2})dx=(x-\operatorname{sen}^2(x)-4xye^{xy^2})dy$

(22) $(4x^3y-15x^2-y)dx+(x^4+3y^2-x)dy=0$

(23) $\left(\dfrac{1}{x}+\dfrac{1}{x^2}-\dfrac{y}{x^2+y^2}\right)dx+\left(ye^y+\dfrac{x}{x^2+y^2}\right)dy$