$$(576-x^2)\frac{dy}{dx}-\frac{1}{24}x^2y=(24+x)\sqrt{576-x^2}$$

$$\frac{dy}{dx}-\frac{x^2}{24(576-x^2)}y=\frac{(24+x)(576-x^2)^{1/2}}{576-x^2}$$

$$\frac{dy}{dx}-\frac{x^2}{24(576-x^2)}y=\frac{24+x}{(576-x^2)^{1/2}}$$

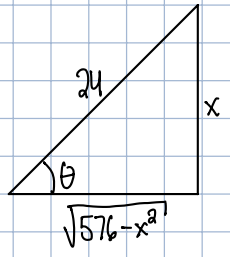
$$y'-\frac{x^2}{24(576-x^2)}y=\frac{(24+x)^{1/2}}{(24-x)^{1/2}}$$

$$p=\frac{x^2}{24(576-x^2)},\quad q=\left(\frac{24+x}{24-x}\right)^{1/2}$$

$$\left(\frac{\sin^2\theta}{\cos^2\theta}\right)\left(\frac{1}{\cos\theta}\right)=\frac{\sin^2\theta}{\cos^3\theta}=\frac{1-\cos^2\theta}{\cos^3\theta}=\sec^3\theta-\sec\theta$$

$$\left(\frac{\sin^2\theta}{\cos^2\theta}\right)\left(\frac{\cos\theta}{1}\right)=\sin^2\theta(\sec\theta)$$

$$=\sec\theta(1-\cos^2\theta)$$
$$=\sec\theta-\cos\theta$$



$$a^2+b^2=c^2$$

$$a^2+x^2=c^2$$
$$a=\sqrt{c^2-x^2}$$

$$\mu(x)=e^{-x/24}\left(\frac{24+x}{(576-x^2)^{1/2}}\right)$$

$$q=\left(\frac{24+x}{24-x}\right)^{1/2}$$

$$\mu q=e^{-x/24}\left(\frac{24+x}{(24-x)^{1/2}(24+x)^{1/2}}\right)\left(\frac{(24+x)^{1/2}}{(24-x)^{1/2}}\right)$$

$$\mu q=e^{-x/24}\left(\frac{24+x}{24-x}\right)$$

$$-\frac{1}{2}+\frac{a}{2}=\frac{1}{2}\quad((24-x)(24+x))^{1/2}$$

$$=(24-x)^{1/2}(24+x)^{1/2}$$

$$\mu(x)=e^{\int p\,dx}$$

$$\int p\,dx\to\frac{1}{24}\int\frac{x^2}{576-x^2}\,dx\quad\begin{cases}x=24\sin\theta\\dx=24\cos\theta\,d\theta\end{cases}$$

$$=\frac{1}{24}\int\left(\frac{576\sin^2\theta}{576(1-\sin^2\theta)}\right)\left(\frac{24\cos\theta}{1}\right)d\theta$$

$$=\int\tan^2\theta\sec\theta\,d\theta$$

$$=\int(\sec\theta-\cos\theta)\,d\theta$$

$$=\ln|\sec\theta+\tan\theta|-\sin\theta+C$$
$$=\ln\left(\frac{24+x}{(576-x^2)^{1/2}}\right)-\frac{x}{24}+C$$

$$\mu(x)=e^{\left(\ln\left(\frac{24+x}{(576-x^2)^{1/2}}\right)-\frac{x}{24}\right)}$$

$$=\frac{e^{\ln\left(\frac{24+x}{(576-x^2)^{1/2}}\right)}}{e^{x/24}}$$

$$\mu y=\int e^{-x/24}\left(\frac{24+x}{24-x}\right)dx$$

$$\left(\frac{\sin^2\theta}{\cos^2\theta}\right)\left(\frac{1}{\cos\theta}\right)=\frac{\sin^2\theta}{\cos^3\theta}=\sin^2\theta\sec^3\theta$$

$$(576-x^2)\frac{dy}{dx}-\frac{1}{24}x^2y=(24+x)\sqrt{576-x^2}$$

$$\frac{dy}{dx}-\frac{x^2}{24(576-x^2)}y=\frac{(24+x)(576-x^2)^{1/2}}{576-x^2}$$

$y'-py=q \rightarrow vy'-vyp=vq \rightarrow vy'-v'p=vq \rightarrow (vy)'=vq \rightarrow vy=\int vq$

$$\frac{dy}{dx}-\frac{x^2}{24(576-x^2)}y=\frac{(24+x)^{1/2}}{(24-x)^{1/2}}$$

$$y=e^{\frac{1}{24}\int\frac{x^2}{576-x^2}dx}$$

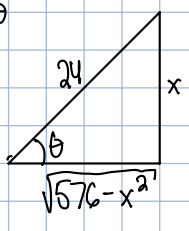
$$\int p\,dx \rightarrow \frac{1}{24}\int\frac{x^2}{576-x^2}dx$$

$$=-\frac{1}{24}\int\frac{x^2}{x^2-576}dx \qquad \begin{array}{r|l} x^2-576 & 1 \\ -(x^2-576) & x^2 \\ \hline 576 & \end{array}$$

$$y=e^{-\frac{1}{24}\int 1+\frac{576}{576-x^2}dx}$$

$$=e^{-\frac{x}{24}-24\int\frac{1}{576-x^2}dx} \quad \begin{cases} x=24\sin\theta \\ dx=24\cos\theta\,d\theta \end{cases}$$

$$=e^{-\frac{x}{24}-\int\sec\theta\,d\theta} \qquad \sin\theta=\frac{x}{24}$$



$$=e^{-\frac{x}{24}-\ln|\sec\theta+\tan\theta|}$$

$$=e^{-\frac{x}{24}-\ln\left|\frac{24+x}{\sqrt{576-x^2}}\right|}=e^{-\frac{x}{24}}e^{-\ln\left|\frac{24}{\sqrt{576-x^2}}\right|}$$

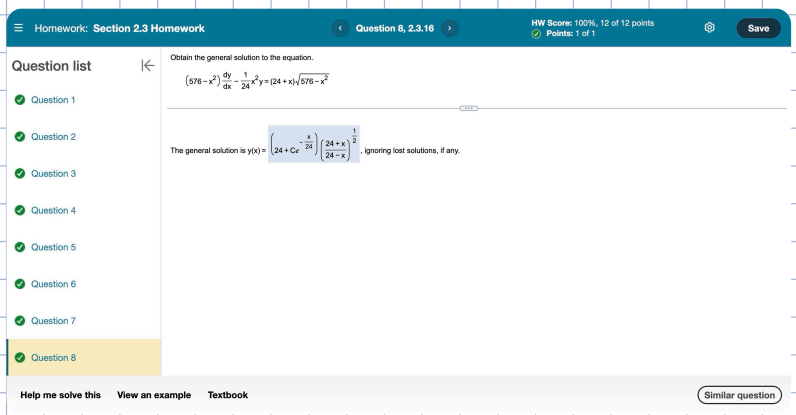
$$\underline{\nu(x)=\left(\frac{24-x}{24+x}\right)^{1/2}e^{-x/24}} \qquad \nu(x)\left(\frac{dy}{dx}-\frac{x^2}{24(576-x^2)}y=\frac{(24+x)^{1/2}}{(24-x)^{1/2}}\right)$$

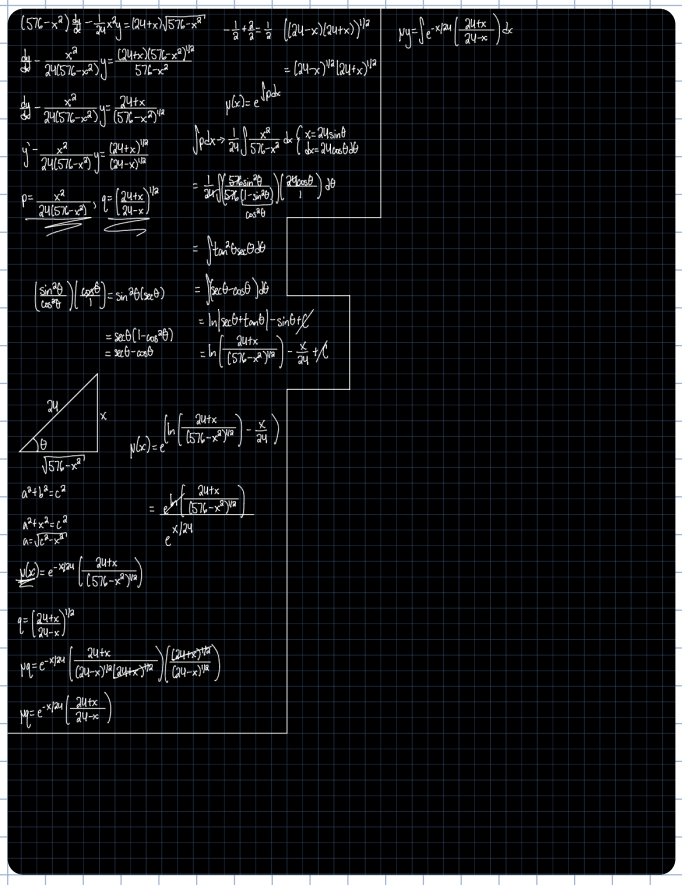
$$=\frac{d}{dx}(\nu y)=e^{-\frac{x}{24}}$$

$$\nu y=-24\int e^{-x/24}dx$$

$$y=-24\sqrt{\frac{24+x}{24-x}}+Ce^{-x/24}\sqrt{\frac{24+x}{24-x}}$$

$$\boxed{y=\sqrt{\frac{24+x}{24-x}}\left(Ce^{-x/24}+24\right)}$$





$$(576-x^2)\frac{dy}{dx}-\frac{1}{24}x^2y=(24+x)\sqrt{576-x^2}$$

$$\frac{dy}{dx}-\frac{x^2}{24(576-x^2)}y=\frac{(24+x)(576-x^2)^{1/2}}{576-x^2}$$

$$\frac{dy}{dx}-\frac{x^2}{24(576-x^2)}y=\frac{24+x}{(576-x^2)^{1/2}}$$

$$y'-\frac{x^2}{24(576-x^2)}y=\frac{(24+x)^{1/2}}{(24-x)^{1/2}}$$

$$p=\frac{x^2}{24(576-x^2)},\quad q=\left(\frac{24+x}{24-x}\right)^{1/2}$$

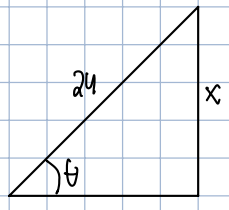
$$\left(\frac{\sin^2\theta}{\cos^2\theta}\right)\left(\frac{1}{\cos\theta}\right)$$

$$=\frac{\sin^2\theta}{\sec^3\theta}$$

$$=\sin^2\theta\cos^3\theta$$

$x=24\sin\theta$

$\sin\theta=\frac{x}{24}$



$$a^2+x^2=24^2$$

$$a=(576-x^2)^{1/2}$$

$$-\frac{3}{2}+\frac{1}{2}=-\frac{2}{2}-1$$

$$q=\left(\frac{24+x}{24-x}\right)^{1/2}$$

$$pq=\frac{(24+x)^{1/2}}{(24-x)^{1/2}}\,\frac{(576-x^2)^3}{(x+24)^{3/2}}\,e^{\left(\frac{x}{(576-x^2)^{1/2}}\right)}$$

$$=\frac{(576-x^2)^3}{(x+24)(24-x)^{1/2}}\,e^{\left(\frac{x}{(576-x^2)^{1/2}}\right)}$$

$$\mu y=\int\left(\frac{(576-x^2)^3}{(x+24)(24-x)^{1/2}}\,e^{\left(\frac{x}{(576-x^2)^{1/2}}\right)}\right)dx$$

$$-\frac{1}{2}+\frac{2}{2}=\frac{1}{2}\qquad\left((24-x)(24+x)\right)^{1/2}$$

$$=(24-x)^{1/2}(24+x)^{1/2}$$

$$\mu(x)=e^{\int p\,dx}$$

$$\int p\,dx\to\frac{1}{24}\int\frac{x^2}{576-x^2}\,dx\qquad\begin{cases}x=24\sin\theta\\ dx=24\cos\theta\,d\theta\end{cases}$$

$$=\frac{1}{24}\int\left(\frac{576\sin^2\theta}{576\underbrace{(1-\sin^2\theta)}_{\cos^2\theta}}\right)\left(\frac{24}{\cos\theta}\right)d\theta$$

$$=\int\tan^2\theta\sec\theta\,d\theta$$

$$\to=\frac{1}{2}\sec\theta\tan\theta-\frac{1}{2}\ln|\sec\theta+\tan\theta|-\ln|\sec\theta+\tan\theta|$$

$$-\frac{1}{2}-\frac{2}{2}=-\frac{3}{2}$$

$$=\frac{1}{2}\sec\theta\tan\theta-\frac{3}{2}\ln|\sec\theta+\tan\theta|$$

$$=\frac{1}{2}\left(\frac{12}{(576-x^2)^{1/2}}\right)\left(\frac{x}{(576-x^2)^{1/2}}\right)-\frac{3}{2}\ln\left|\frac{x+24}{(576-x^2)^{1/2}}\right|$$

$$=\frac{x}{(576-x^2)^{1/2}}+\ln\left|\left(\frac{x+24}{(576-x^2)^{1/2}}\right)^{-3/2}\right|$$

$$\frac{x}{(576-x^2)^{1/2}}+\ln\left|\frac{(576-x^2)^3}{(x+24)^{3/2}}\right|$$

$$\mu(x)=e^{\left(\frac{x}{(576-x^2)^{1/2}}\right)}\,e^{\ln\left|\frac{(576-x^2)^3}{(x+24)^{3/2}}\right|}$$

$$\mu(x)=\frac{(576-x^2)^3}{(x+24)^{3/2}}\,e^{\left(\frac{x}{(576-x^2)^{1/2}}\right)}$$

$$\int\tan^2\theta\sec\theta\,d\theta$$

$$\int(\sec\theta(\sec^2\theta-1))$$

$$\int\sec^3\theta-\sec\theta\,d\theta$$

$$=-\ln|\sec\theta+\tan\theta|+\int\sec^3\theta$$

$$\overbrace{\int\sec^3\theta\,d\theta}^{I}=\int\sec\theta(\sec^2\theta)\,d\theta\qquad\begin{cases}u=\sec\theta & du=\sec\theta\tan\theta\,d\theta\\ dv=\sec^2\theta\,d\theta & v=\tan\theta\end{cases}$$

$$I=\sec\theta\tan\theta-\int\sec\theta\tan^2\theta\,d\theta$$

$$I=\sec\theta\tan\theta-\int\sec\theta(\sec^2\theta-1)\,d\theta$$

$$I=\sec\theta\tan\theta-\int\sec^3\theta-\sec\theta\,d\theta$$

$$I=\sec\theta\tan\theta-\ln|\sec\theta+\tan\theta|-\int\sec^3\theta$$

$$2I=\sec\theta\tan\theta-\ln|\sec\theta+\tan\theta|$$

$$I=\frac{1}{2}\sec\theta\tan\theta-\frac{1}{2}\ln|\sec\theta+\tan\theta|$$

$$\left(\frac{x+24}{(576-x^2)^{1/2}}\right)^{-3/2}$$

$$=\frac{\left((576-x^2)^{1/2}\right)^{3/2}}{(x+24)^{3/2}}=\frac{(576-x^2)^3}{(x+24)^{3/2}}$$

$$\boxed{y(x)=\left(24+Ce^{-x/24}\right)\left(\frac{24+x}{24-x}\right)^{1/2}}$$

$$= \int \sin^2\theta \cos^3\theta \, d\theta$$

$$= \int \sin^2\theta (1-\sin^2\theta)\cos\theta \, d\theta \quad \begin{cases} u = \sin\theta \\ du = \cos\theta \, d\theta \end{cases}$$

$$= \int u^2 (1-u^2) \, du$$

$$= \int (u^2 - u^4) \, du$$

$$= \frac{1}{3}u^3 - \frac{1}{5}u^5 + C$$

$$= \frac{1}{3}\sin^3\theta - \frac{1}{5}\sin^5\theta + C$$

$$= \frac{1}{3}\left(\frac{x}{24}\right)^3 - \frac{1}{5}\left(\frac{x}{24}\right)^5$$