1. Is $y=e^{-3t}$ an eigenfunction of $\frac{d}{dt}$? If yes, eigenvalue? Yes $\lambda=-3$

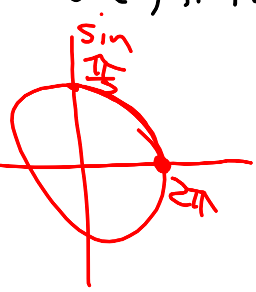
2. Is $y=\sin 2t$ " " " No "

3. Is $y=e^{-3t}$ " " of $\frac{d^2}{dt^2}$? Yes " $\lambda=9$

4. Is $y=\sin 2t$ " " " Yes " $\lambda=-4$

5. Solve $\sin x=1$, giving answer(s) in radians.

$x=\frac{\pi}{2}, \frac{5\pi}{2}, \cancel{\frac{\pi}{2}}, \frac{9\pi}{2}, \frac{13\pi}{2}, \ldots$



Solve the BVP Example 5.3(a)

$y''+\lambda^2 y=0$, $y(0)=0$, $y'(2\pi)=0$

indep var is x

$r^2+\lambda^2=0$

$r^2=-\lambda^2$

$r=\lambda i$

$$\boxed{y=C_1\sin\lambda x + C_2\cos\lambda x}$$

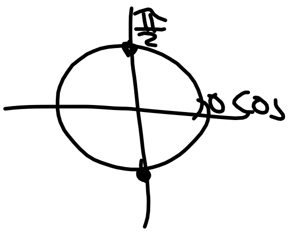
$$C_2=0 \Rightarrow \boxed{y=C_1\sin\lambda x}$$

$y'=C_1\lambda\cos\lambda x$

$0=C_1\lambda\underbrace{\cos 2\pi\lambda}$

$\cos \underbrace{2\pi\lambda}=0$

$\cos\theta=0$ $\quad \theta=\frac{\pi}{2},\frac{3\pi}{2},\frac{7\pi}{2},\frac{9\pi}{2},\dots$



$2\pi\lambda=\frac{\pi}{2},\frac{3\pi}{2},\frac{7\pi}{2},\frac{9\pi}{2},\dots$

$$\boxed{\lambda=\frac{1}{4},\frac{3}{4},\frac{7}{4},\frac{9}{4},\dots}$$

There are infinitely many solutions,

$y=C\sin\frac{1}{4}x,\ C\sin\frac{3}{4}x,\ C\sin\frac{7}{4}x,\dots$

Solve $y'' + \lambda^2 y = 0$ means find a y for which

$$\frac{d^2y}{dx^2} = -\lambda^2 y$$

$$\frac{d^2}{dx^2}(y) = -\lambda^2 y$$ means find an eigenfunction and eigenvalue for $\frac{d^2}{dx^2}$

w/