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#### 4. F4.

4(a)


2/2 points (graded)

Find all negative real numbers  $\lambda_k$  for  $k = 1, 2, 3, \dots$ , for which the boundary value problem

$$\begin{aligned}\frac{d^2}{dx^2} v_k(x) &= \lambda_k v_k(x) \\ v_k(0) &= 0 \\ v_k(\pi/6) &= 0\end{aligned}$$

has a solution  $v_k(x)$  that is not the zero function.

(Note that  $\lambda_k$  is negative,  $k$  is nonnegative, and  $|\lambda_1| < |\lambda_2| < |\lambda_3| < \dots$ .)

$\lambda_k =$   

Find the  $k = 1$  eigenfunction  $v_1(x)$  with amplitude 1.



$$v_1(x) = \boxed{\sin(6 \cdot x)} \quad \checkmark$$

$\sin(6 \cdot x)$

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You have used 1 of 3 attempts

✓ Correct (2/2 points)

4(b)

2/2 points (graded)

Find all negative real numbers  $\lambda_k$  for  $k = 0, 1, 2, 3, \dots$ , for which the boundary value problem

$$\begin{aligned} \frac{d^2}{dx^2} v_k(x) &= \lambda_k v_k(x) \\ v'_k(0) &= 0 \\ v_k(\pi) &= 0 \end{aligned}$$

has a solution  $v_k(x)$  that is not the zero function.

(Note that  $\lambda_k$  is negative,  $k$  is nonnegative, and  $|\lambda_0| < |\lambda_1| < |\lambda_2| < \dots$ .)

$$\lambda_k = \boxed{-(k+1/2)^2} \quad \checkmark$$

$-\left(k + \frac{1}{2}\right)^2$

Find the  $k = 0$  eigenfunction  $v_0(x)$  with amplitude 1.



$v_0(x) =$   ✓

$\cos\left(\frac{x}{2}\right)$

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You have used 1 of 3 attempts

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✓ Correct (2/2 points)

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