# CG lab 2

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## Exercise 2

**(a)**

$$u-v=(9,8,5)-(6,6,3)=(9-6,8-6,5-3)=(3,2,2)$$

**(b)**

$$u+5v=(9,8,5)+5(6,6,3)=(9+5\times6,8+5\times6,5+3\times5)=(39,38,20)$$

## Exercise 5

$$|u|=\sqrt{(u\cdot u)}=\sqrt{(7,3,8)\cdot(7,3,8)}=\sqrt{(7\times7+3\times3+8\times8)}=\sqrt{122}$$

## Exercise 11 (c)

$$G(f+g)-(G(f)+G(g))=\int_0^1(sinx+e^x)dx-(\int_0^1 sinx\,dx\ +\ \int_0^1 e^x\,dx)=0$$

## Exercise 12 (a)

$$a=\frac{u\cdot e}{|e|^2}\,e=(9/\sqrt{2}+4/\sqrt{2})(1/\sqrt{2},1/\sqrt{2})=(13/2,13/2)$$

$$|a|=13/\sqrt{2}$$

## Exercise 16

$$\begin{pmatrix}9&8\\-8&9\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}4\\3\end{pmatrix}$$

$$A=\begin{pmatrix}9&8\\-8&9\end{pmatrix}\ so\ A^{-1}=\frac{1}{9\times9-(-8\times8)}\begin{pmatrix}9&-8\\8&9\end{pmatrix}=\begin{pmatrix}9/145&-8/145\\8/145&9/145\end{pmatrix}$$

$$so\ (x,y)=\begin{pmatrix}9/145&-8/145\\8/145&9/145\end{pmatrix}\begin{pmatrix}4\\3\end{pmatrix}=(12/145,59/145)$$

## Exercise 20

$$
Q(f)=\int_0^1(\frac{df}{dx})^2dx\\
B(f,g)=\frac{1}{2}(Q(f+g)-Q(f)-Q(g))=\\
\frac{1}{2}\int_0^1[(\frac{d(6x+e^{2x})}{dx})^2-(\frac{d(6x)}{dx})^2-(\frac{d(e^{2x})}{dx})^2]dx
\\=\int_0^1\frac{d6x\cdot de^{4x}}{dx}dx
\\=\int_0^16\cdot2\cdot e^{2x}=6e^2-6
$$

$$Q(f) = \int_0^1 (\frac{df}{dx})^2 dx$$

$$B(f,g) = \frac{1}{2}(Q(f+g) - Q(f) - Q(g)) =$$

$$\frac{1}{2}\int_0^1 [(\frac{d(6x+e^{2x})}{dx})^2 - (\frac{d(6x)}{dx})^2 - (\frac{d(e^{2x})}{dx})^2]dx$$

$$= \int_0^1 \frac{d6x \cdot de^x}{dx} dx$$

$$= \int_0^1 6 \cdot 2 \cdot e^{2x} = 6e^2 - 6$$

$$Q(f) = \int_0^1 (\frac{df}{dx})^2 dx$$

$$B(f,g) = \frac{1}{2}(Q(f+g) - Q(f) - Q(g)) =$$

$$\frac{1}{2}\int_0^1 [(\frac{d(6x+e^{2x})}{dx})^2 - (\frac{d(6x)}{dx})^2 - (\frac{d(e^{2x})}{dx})^2]dx$$

$$= \int_0^1 \frac{d6x \cdot de^{4x}}{dx} dx$$

$$= \int_0^1 6 \cdot 2 \cdot e^{2x} = 6e^2 - 6$$

## Exercise 22 (a)

$$A\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 5x_1 \\ 6x_2 \\ x_1 + x_2 \end{pmatrix}$$

$$so\ A = \begin{pmatrix} 5 & 0 \\ 0 & 6 \\ 1 & 1 \end{pmatrix}$$