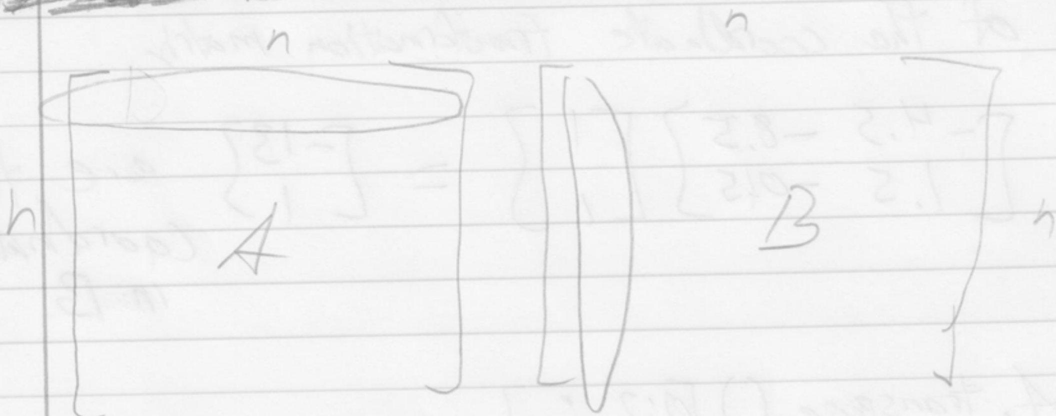
1) [redacted]



dot product $O(n)$

for each row in A

$O(n)\,O(n)$ If stop here have matrix-vector multiplication $O(n^2)$

for each column in B

$O(n)\,O(n)\,O(n) = O(n^3)$

2) Answer C: $n^{3.5}$

Big O provides upper bound on growth of biggest term in expression.

3) Get the coordinate transformation matrix by finding the coordinates of the basis vectors of A in terms of B

$$\begin{bmatrix}6\\3\end{bmatrix} = \begin{bmatrix}-1&1\\0&2\end{bmatrix}\begin{bmatrix}c_1\\c_2\end{bmatrix} \Rightarrow \begin{bmatrix}c_1\\c_2\end{bmatrix} = \begin{bmatrix}-4.5\\1.5\end{bmatrix}$$

$$\begin{bmatrix}8\\-1\end{bmatrix} = \begin{bmatrix}-1&1\\0&2\end{bmatrix}\begin{bmatrix}d_1\\d_2\end{bmatrix} \Rightarrow \begin{bmatrix}d_1\\d_2\end{bmatrix} = \begin{bmatrix}-8.5\\-0.5\end{bmatrix}$$

continued on next page

3(cont.)

So $\vec{c}$ and ~~$\vec{d}$ are the vectors~~ of the coordinate transformation matrix

$$\begin{bmatrix} -4.5 & -8.5 \\ 1.5 & -0.5 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} -13 \\ 1 \end{bmatrix}$$ are the coordinates in B

4) A.transpose()[0:2, :]

5) a) The derivatives of function at the expansion point must be calculable.

b) The taylor Series must converge to the original function near the expansion point.

c) The evaluation point must be within the region of convergence of the taylor series.

6) Taylor

$$\frac{f(a)}{0!}(x-a)^0 + \frac{f'(a)}{1!}(x-a)^1 + \frac{f''(a)}{2!}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \frac{f^{IV}(a)}{4!}(x-a)^4$$

with $a = 0$

$$\frac{f(0)}{1}(x)^0 + \frac{f'(0)}{1}(x)^1 + \frac{f''(0)}{2}(x)^2 + \frac{f'''(0)}{6}(x^3) + \frac{f^{IV}(0)}{24}x^4$$

$$= 1 - \frac{\sin(0)x}{1} - \frac{\cos(0)x^2}{2} + \frac{\sin(0)(x^3)}{6} + \frac{\cos(0)x^4}{4!}$$

$$= 1 - \frac{x^2}{2} + \frac{x^4}{24}$$ watch the sign change