Theory and Practice of Deep learning
Theory Homework 1

Shaun Toh 1002012

11/2/2019

1 Task 1

1.1 Question 1

$$X \cdot A + A^T = I$$
$$X = (I - A^T)A^{-1})$$

1.2 Question 2

$$X^T C = [2A(X + B)]^T = I$$

"I" implies that the end result is a square matrix.

$$X^T C = [2AX]^T + [2AB]^T = I$$
$$X^T C - [2AX]^T = [2AB]^T = I - [2AX]^T$$

Ignoring the identity portion,

$$X^T[C - 2A^T] = [2AB]^T$$
$$X = ([2AB]^T[C - 2A^T]^{-1})^T$$

1.3 Question 3

1.3.1 Part 1

$$(Ax - y)^T A = 0$$
$$Ax^T A - y^T A = 0$$
$$Ax^T A = y^T A$$
$$A^{-1}Ax^T AA^{-1} = A^{-1}Y^T AA^{-}1$$
$$x^T = A^{-1}Y^T$$

1.3.2 Part 2

$$(Ax - y)^T A + x^T B = 0$$
$$(Ax)^T A - y^T A + x^T B = 0$$
$$(Ax)^T + x^T B A^{-1} = y^T$$
$$x^T A^T + x^T B A^{-1} = y^T$$
$$x^T [A^T + B A^{-1}] = Y^T$$
$$x^T = y^T [A^T + B A^{-1}]^{-1}$$
$$x = (y^T [A^T + B A^{-1}]^{-1})^T$$

2 Task 2

pls