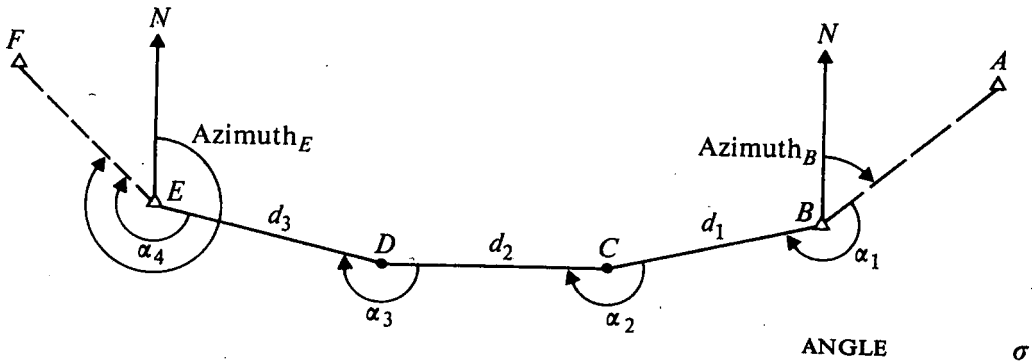
Dada Adj 2: Homework 2

4 Mar 2009, due Fri. 13 Mar

1. Solve the traverse problem shown (taken from prob 36, p. 327 in text)



ANGLE	σ	DISTANCE	σ
$\alpha_1 = 172°53'34''$	2″	$d_1 = 281.832$ m	0.016 m
$\alpha_2 = 185°22'14''$	2″	$d_2 = 271.300$ m	0.016 m
$\alpha_3 = 208°26'19''$	2″	$d_3 = 274.100$ m	0.016 m
$\alpha_4 = 205°13'51''$	2″		

POINT	COORDINATES		
	X (m)	Y (m)	AZIMUTH
B	8478.139	2483.826	68°15'20"7
E	7709.336	2263.411	300°11'30"5

(a) solve first by conventional LS.

(b) solve again by unified LS with point observations:

C: 8231.260, 2347.770

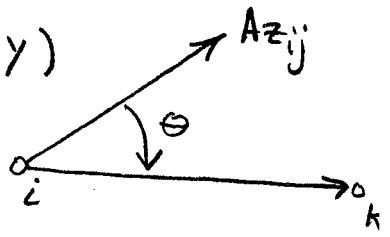
D: 7982.450, 2239.725

$\sigma_x, \sigma_y = .015$

Use your existing matlab functions for evaluating 2D angle and distance equations, and create 2 new functions:

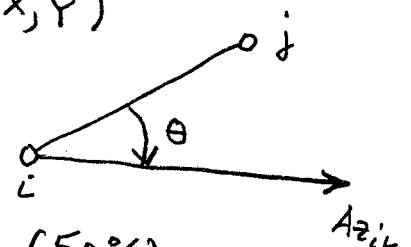
$$\left[F_a, \frac{\partial F}{\partial x_i}, \frac{\partial F}{\partial y_i}, \frac{\partial F}{\partial x_k}, \frac{\partial F}{\partial y_k}\right] = \text{angle\_azij}\,(a, i, k, Az_{ij}, X, Y)$$

$$\theta = \tan^{-1}\left(\frac{x_k - x_i}{y_k - y_i}\right) - Az_{ij}$$



$$\left[F_a, \frac{\partial F}{\partial x_i}, \frac{\partial F}{\partial y_i}, \frac{\partial F}{\partial x_j}, \frac{\partial F}{\partial y_j}\right] = \text{angle\_azik}\,(a, i, j, Azik, X, Y)$$

$$\theta = Azik - \tan^{-1}\left(\frac{x_j - x_i}{y_j - y_i}\right)$$



in each case make global test & show error ellipses (50%) for points C & D. Be sure and show your redundancy for part (b)

2. Fit a plane of the form $z = a_0 + a_1 x + a_2 y$ to the points:

x	y	z
1	1	3.05
1	2	3.16
2	1	2.95
2	2	3.12

x, y: constant
z: observed with $\sigma_z = .03$

(a) solve with conventional LS

(b) solve by <u>unified LS</u> with parameter observations $a_1 = a_2 = 0$, with $\sigma_{a_1} = \sigma_{a_2} = .05$

[note you could also do part (b) by conventional LS with the model $Av + B\ell = f$. If you wanted to confirm your solution to (b) you have an easy way to do it.]