

Geography 416-411
Exercise #5
Wind Speed Profile
10 points

Name: _____

1. Given the following wind speed profile:

z(cm)	10	20	50	100	200	300	400	500	600
u (m/s)	1.50	1.85	2.40	2.91	3.32	3.57	3.75	3.89	4.05
k_m									

Determine: roughness parameter, z_0 (m)

Wind Speed Profile Formula (1st approximation only)

Friction velocity, u_* (m / s)

Shear Stress, τ (Nt / m²)

Momentum diffusivity, k_m (m² / s, for each z above)

Note: $\rho_{\text{air}} = 1.205 \text{ kg / m}^3$

k (von Karman) = 0.39

Key Equations: $\text{Slope}_{10} = [(y_2 - y_1) / (L)] / (x_2 - x_1)$

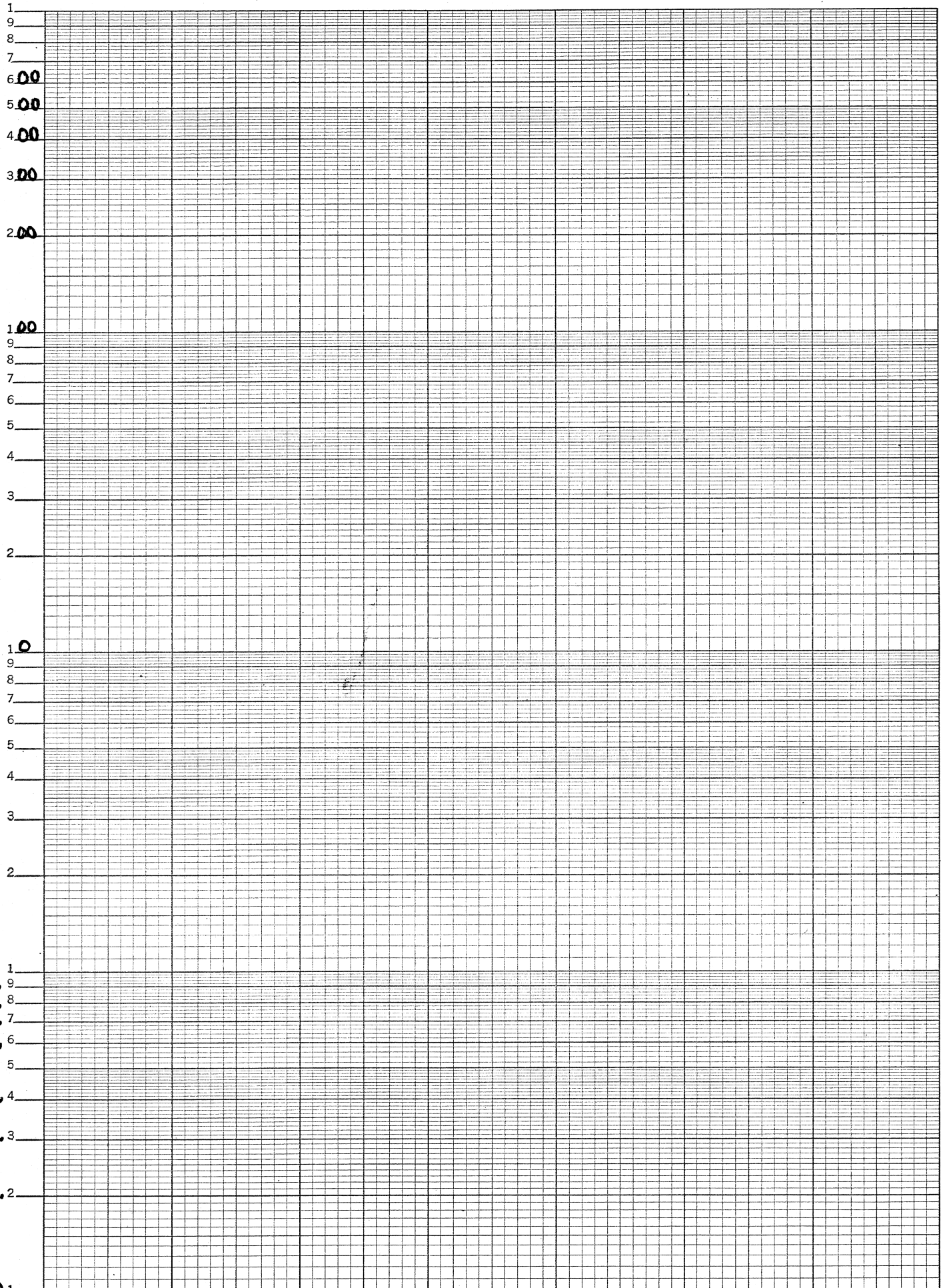
$\text{Slope}_e = 2.303 \text{ Slope}_{10}$

$u_* = k / \text{Slope}_e$

$u(z) = (u_* / k) \ln(z / z_0)$

$\tau = u_*^2 \rho$

$k_m = k u_* z$



Semi-Logarithmic
4 Cycles x 10 to the Inch

0 1 2 3 4 5