TIMOSHENKO, "ADVANCED DYNAMICS", MgGraw-Hill Book COmpany, Inc. , 1948, p9

PROBLEMS

1. Under the influence of gravity and without resistance, particles start simultaneously from rest at O and slide along variously inclined straight grooves cut in the surface of a cone with inclined axis (Fig. 9). Prove that after any lapse of time t, all the particles will lie on the surface of a sphere of diameter $D = \frac{1}{2}gt^2$.

intial start position t =0 and velocity = 0
the constants of intergration A and B = 0 in these cases

FREE BODY DIAGRAM OF THE RED PARTICLE

sin b = my`` / mg

y`` = g sin b

y` = g sin(b) t + A

y = 0.5 g sin(b) t^2 + At + B
where A and B = 0
Y = Z sin(b)

b, N1, mg, my``

D'Alembert's Principle

O

sin 41.63x 400 = 266

41.63°

Y = 266

69.44°

SECTION OF A SPHERE
DIA 400

Y = 375

sin 69.44 x 400 = 375

Z = 400

THE ORANGE PARTICLE IS OUT OF THE PLANE OF THE AXIAL TRIANGLE
SEE DRG TDP2

IF THE RED,ORANGE AND BLUE PARTICLES ARE ALIGNED THE SECTION THROUGH THE SPHERE MUST BE A CIRCLE AND A CIRCLE FOR THE OBLIQUE CONE WHICH IS KNOWN AS THE SUBCONTRARY SECTION

41.63°

69.44°

AXIAL TRIANGE OF AN OBLIQUE CONE

FREE BODY DIAGRAM OF BLUE PARTICLE

N, a, m x``, mg

sin a = mx`` / mg

x`` = g sin a

x` = g sin(a) t + A

x = 0.5 g sin(a) t^2 + At + B
where A and B = 0
X = Z sin(a)

IMAGINE THIS PARTICLE DROPS THORUGH THE CENTRE OF THE SPHERE UNDER THE FORCE OF GRAVITY

FREE BODY DIAGRAM OF THE BLACK PARTICLE

mz`` = mg

z`` = g

z` = g t + A

z = 0.5 g t^2 + At + B
where A = 0 and B=0
Z = 0.5 g t^2

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SCALE	Timoshenko Dynamics Problem,
DRN. TH	
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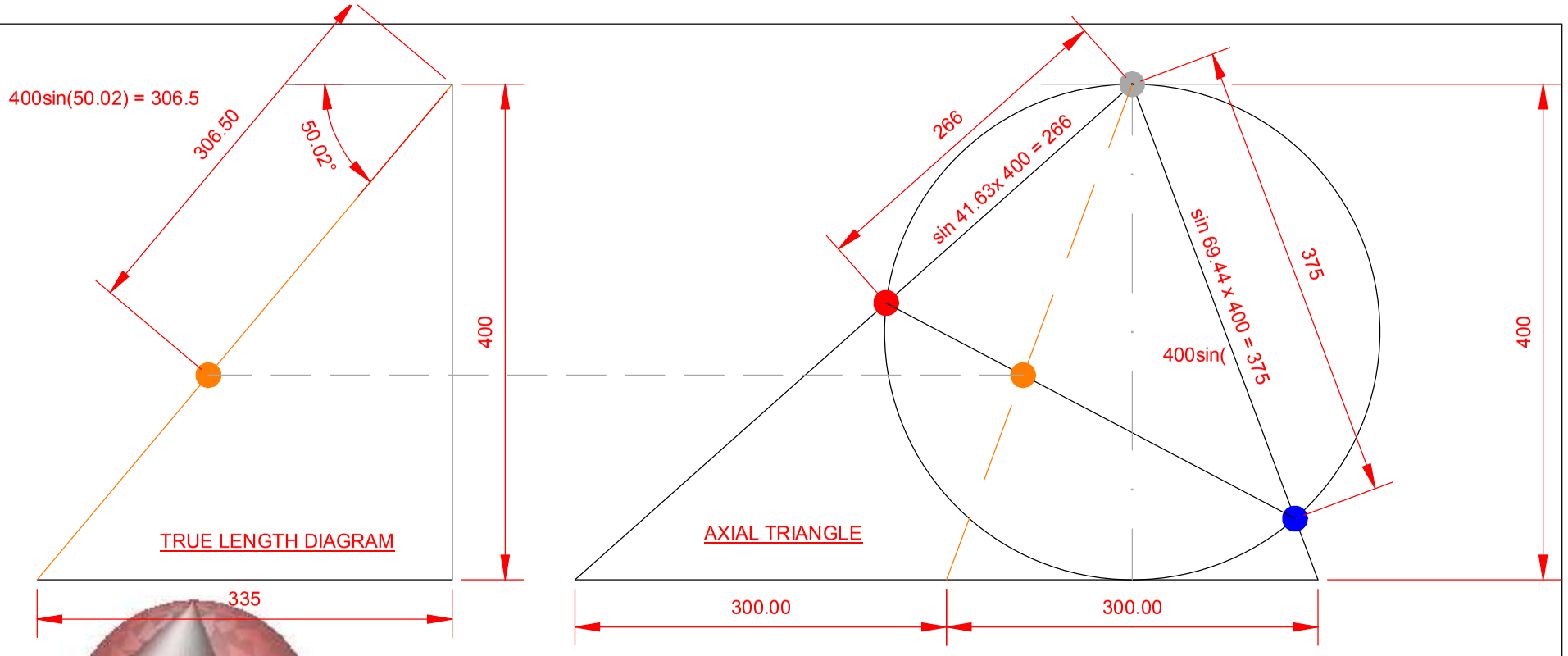
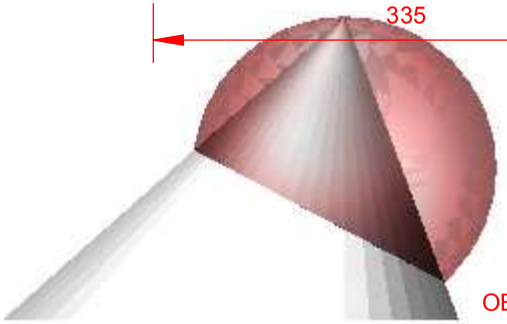
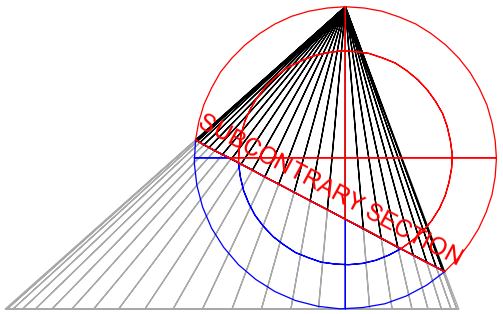
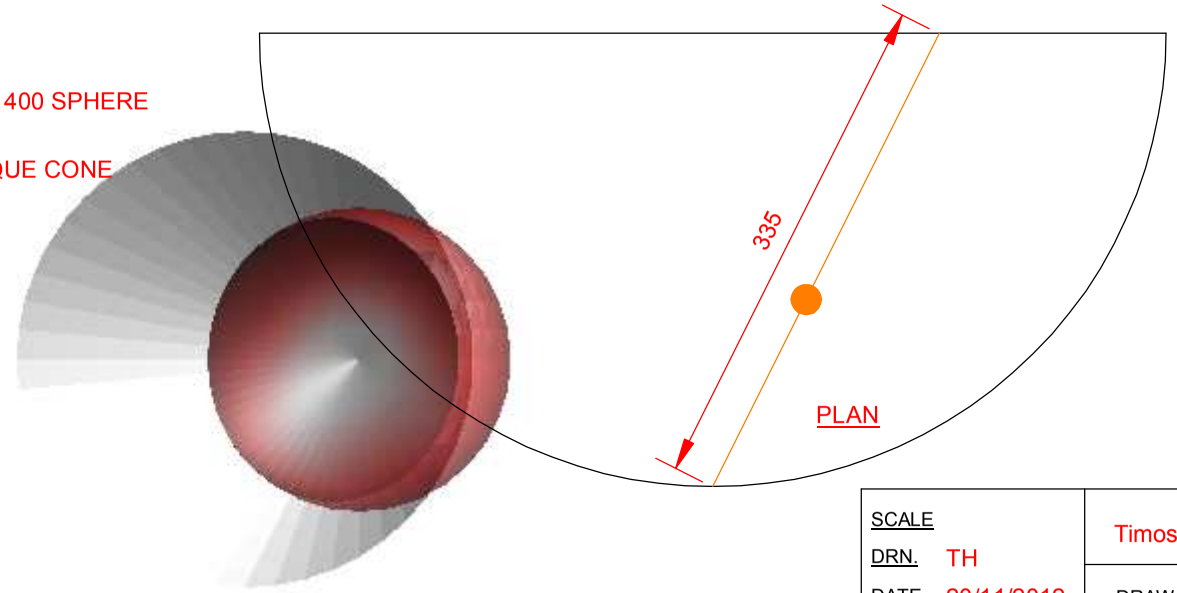




DIA 400 SPHERE

OBLIQUE CONE





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