Phys 218 – Fall 2018

All *University Physics* Sections

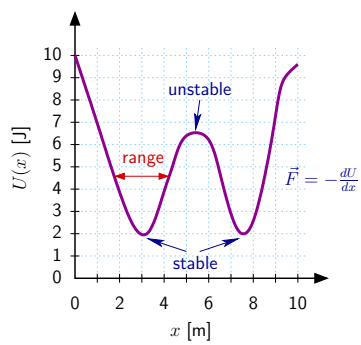
Comprehensive Exam

Short Answer:

A) *(i)* $1.8 \leq x \leq 4.2$ (or anything close to this) [LO 41.1, 43.1]

(ii) $-\hat{i}$ direction [LO 37.1, 44.1]

(iii) [LO 37.2, 42.1, 42.2, 42.3]



B) *i)* $a = G\frac{M_\oplus}{(R_\oplus+h)^2}$ [LO 6.1, 21.1, 60.1]

ii) $v = \sqrt{\frac{GM_\oplus}{R_\oplus+h}}$ [LO 16.1, 18.1, 60.2]

iii) $T = 2\pi\sqrt{\frac{(R_\oplus+h)^3}{GM_\oplus}}$ [LO 63.1]

C) `T` [LO 65.1]

`T`, `F` [LO 65.2]

`F`, `T` [LO 65.3]

D) *i)* $\tau = RF$ and $\alpha = 2F/MR$ [LO 2.1, 51.1, 54.1, 55.1]

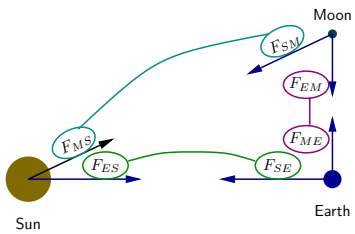
ii) $W = RF\Delta\theta$ [LO 32.1]

iii) $\omega = \frac{2}{R}\sqrt{\frac{W_{\text{you}}}{M}}$ [LO 6.2, 35.1, 39.1]

E) $\theta = \tan^{-1}\left(\frac{h+\frac{1}{2}g}{d}\right)$ and [LO 1.1, 4.1, 14.1, 14.2]

$v_0 = \sqrt{d^2 + (h+\frac{1}{2}g)^2} = d/\cos\left[\tan^{-1}\left(\frac{h+\frac{1}{2}g}{d}\right)\right]$

F) [LO 22.1, 22.2, 22.3, 60.3, 60.4, 60.5]



Problem 1:

a) $m = 0.25$ kg [LO 10.1]

b) $K_i = 450$ J [LO 34.1]

c) $v_f = 3$ m/s [LO 3.1, 46.1, 46.2, 48.1]

d) $K_f = 22.5$ J; inelastic [LO 34.2, 50.1]

e) $h = \frac{9}{20}$ m [LO 34.3, 38.1, 40.1]

f) No [LO 59.1]

Problem 2:

a) $a = \frac{1}{2}(R_p + R_a)$ [LO 63.2, 64.1, 64.2]

b) $e = 59/61$ [LO 63.3, 64.3]

c) $v_p/v_a = 60$ [LO 59.2, 63.4]

d) $F_p/F_a = 3600$ [LO 60.6]

Problem 3:

a) $|\vec{F}| = 200$ N [LO 25.1]

b) Conservative [LO 36.1]

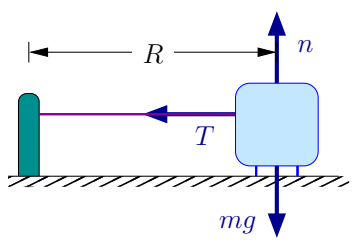
c) $E_{\text{tot}} = 45$ J [LO 34.4, 38.2, 40.2]

d) $A = 0.3$ m [LO 38.3, 65.4]

e) $v_{\text{max}} = \sqrt{45}$ m/s [LO 34.5, 65.5]

Problem 4:

a) [LO 23.1, 24.1, 26.1]



b) $a_{\text{rad}} = v^2/R$ and $a_{\text{tan}} = 0$ [LO 13.1, 16.2, 17.1, 18.2, 19.1]

c) $m = TR/v^2$ [LO 6.3, 21.2]

d) $K = \frac{1}{2}TR$ [LO 34.6]

e) Both energy and angular momentum are conserved [LO 39.2, 40.3, 59.3]