MIDTERM PRACTICE 2

1) (2) $F_{net} = ma$

$8 - 3 = 2a$

$5 = 2a$

$a = 2.5\ m/s^2$, left.

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2) (1) MASS ≡ inertia

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3) (3) $F_{net} = 0$ means constant velocity - same speed and direction

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4) (2) $F_{net} = 0$ means constant velocity.

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5) (3) $F = ma$

$= 2(5) =$ 10N

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6) (1) $a = \frac{\Delta v}{\Delta t} = \frac{20}{.01} = 2000\ m/s^2 \rightarrow F = ma = (.5)(2000) = 1000N$

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7) (3) $F_{net} = ma$

$8 - 2 = 2a$

$6 = 2a$

$a = 3\ m/s^2$

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8) (3) Pick any point

$F = ma$

$3 = 6a$

$a = .5\ m/s^2$

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9) (4) $F\Delta t = m\Delta v$

$F(.1) = 44(15)$

$F = 6600N$

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10) (1) EQUAL + OPPOSITE FORCES.

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11) (3) EQUAL + OPPOSITE FORCES

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12) (3) $F_g = \frac{Gm_1m_2}{r^2} = \frac{(6.67\times10^{-11})(15)(15)}{3^2} = 1.67\times10^{-9}N$

14. (1) $F_g = \frac{G m_1 m_2}{r^2} \Rightarrow F_g \propto \frac{m}{r^2} \Rightarrow \frac{2}{3^2} = \boxed{\frac{2}{9} F}$

15. (3) $F_g = \frac{G m_1 m_2}{r^2} \rightarrow F_g \propto \frac{1}{r^2} \Rightarrow$ inverse squared

16. (1) $F_g = \frac{G m_1 m_2}{r^2} \Rightarrow F_g \propto \frac{1}{r^2} = \frac{1}{4^2} = \frac{1}{16}$.

17. (2)
$F_g = mg$
$96 = 60g$
$\boxed{g = 1.6\ m/s^2}$

18. (4)
~~Earth~~
$F = ma$
$500 = m(9.8)$
$m = 51.0$

~~Planet~~ asteroid
$F = ma$
$25 = 51a$
$\boxed{a = .49\ m/s^2}$

19. (3) weight = F_g
$F_g = mg = 5(9.8) = 49N$

20. (1) mass always remains the same.

21. (1) F_f doesn't depend on surface area. ($F_f = \mu F_N$)

22. (3) smallest $\mu \Rightarrow$ smallest F_f.

23. (2)

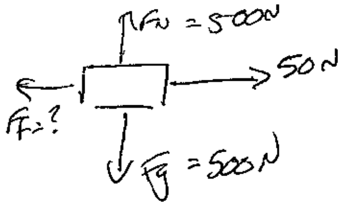
$F_{net} = ma$
$30 - F_f = 2(10)$
$30 - F_f = 20$
$\boxed{F_f = 10N}$

24. (2) Forces cancel = constant speed.

25. (1)

$F_{gx} = 20 \sin 30 = 10$
$F_{gy} = 20 \cos 30 = 17.3$
since constant velocity, force cancel,
so $\boxed{F_f = F_{gx}}$
$F_N = F_{gy}$

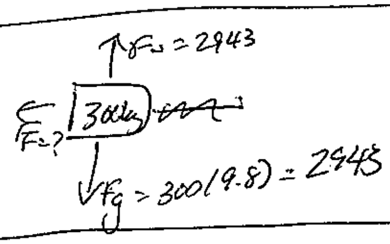
26. (3)



since constant speed, forces cancel.

$\therefore$ $F_f = 50N$

27. (4)

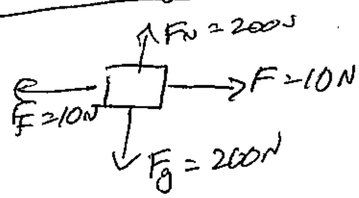


"To start" - must overcome static friction

$F_f = \mu_s F_N$

$= (.74)(2943) = 2178\ N$

28. (2)



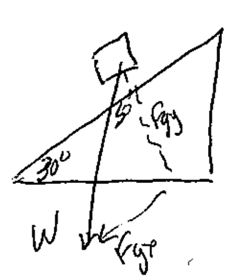
since constant speed, $F_f = F$.

$F_f = \mu F_N$

$10 = \mu(200)$

$\mu = .05$

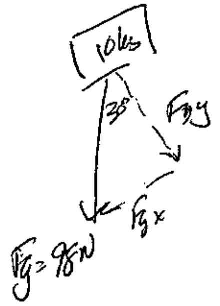
29. (2)



$F_{gx} = W \sin 30 = .5W$ - parallel to plane.

$F_{gy} = W \cos 30 = .87W$

30. (2)



$F_{gx} = 98 \sin 30 = 49$

$F_g = mg = 10(9.8) = 98N$

31. (4) $a = \frac{v^2}{r} = \frac{4^2}{.8} = \frac{16}{.8} = 20\ m/s^2$

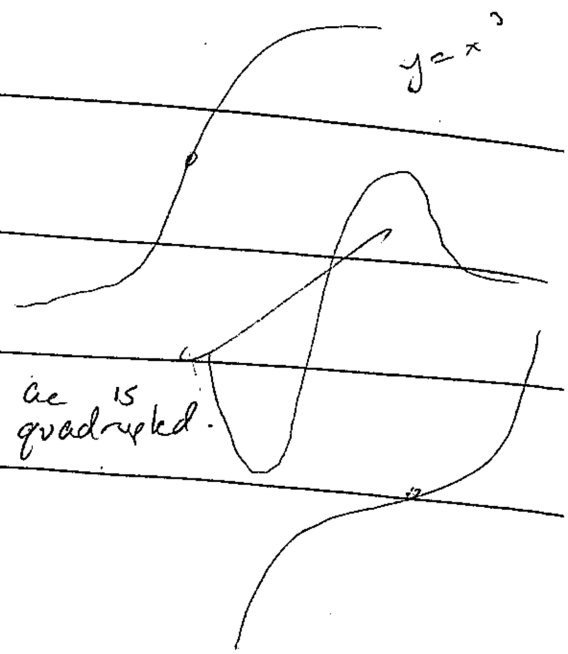
32. (1) Centripedal accel. always toward center.

33. (4) $a_c = \frac{v^2}{r}$ $a_c \propto v^2$. if v is doubled, a_c is quadrupled.

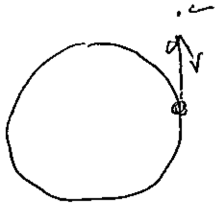
34. (4) $a_c = \frac{v^2}{r} = \frac{20^2}{10} = \frac{400}{10} = 40\ m/s^2$

$F_c = ma_c = (100)(40)$

$= 4000N$



35. (3) velocity is tangent to circle.



36. (4) F_c always toward center.

37. (4) Mass is always the same.

38. (2) EQUAL and OPPOSITES

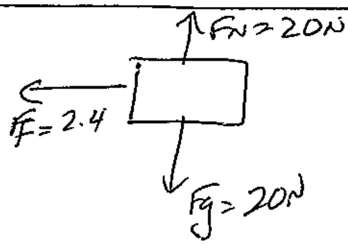
39. (3) F_c always toward center.

40. (3) $a_c = \frac{v^2}{r} = \frac{20^2}{200} = \frac{400}{200} = 2\ m/s^2$

$F_c = ma_c = (1000)(2) = 2000N$

41. (3) ~~$F = ma$~~ $a_c = \frac{v^2}{r}$ does not depend on mass.

42. a)



b) $F_g = mg$

$20 = m(9.8)$

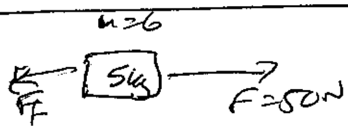
$m = 2.04kg$

$F_{net} = ma$

$2.4 = 2.04a$

$a = 1.18\ m/s^2$

43.

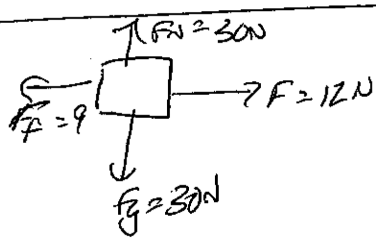


$F_{net} = ma$

$50 - F_f = 5(6)$

$F_f = 20N$

#1



$F_f = \mu F_N$

$= (.3)(30) = 9$

$F_g = mg$

$30 = m(9.8)$

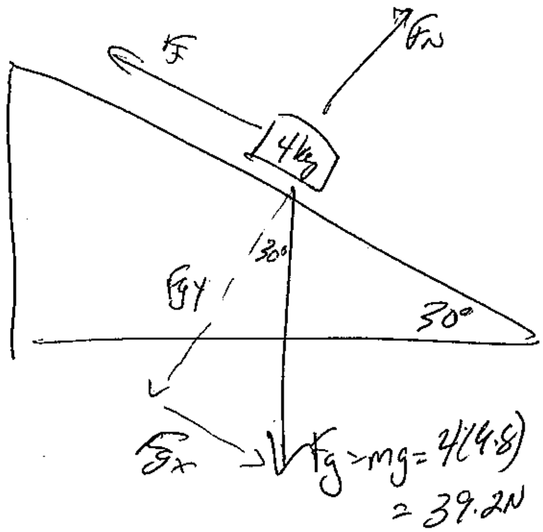
$m = 3.06$

$F_{net} = ma$

$12 - 9 = 3.06a$

$3 = 3.06a$

$a = .98\ m/s$



$F_{gx} = 39.2 \sin 30 = 19.6$

$F_{gy} = 39.2 \cos 30 = 33.9$

- since constant speed, forces cancel

$F_f = F_{gx} = 19.6N$

$F_N = F_{gy} = 33.9N$

$F_f = \mu F_N$

$19.6 = \mu (33.9)$

$\boxed{\mu = .58}$