H Physics

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Circular Motion and Gravitation Re-Test

rE = 6.36 x 106 m mE = 5.98 x 1024 kg G = 6.67 x 10 -11 N m2/kg2  $v=\frac{2πr}{T} v= \sqrt{\frac{Gm\_{2}}{r}}$

$ F\_{s}=µ\_{s}F\_{n} F\_{c}=\frac{mv^{2}}{r}\_{}$ $a\_{c}=\frac{v^{2}}{r} F\_{g}=\frac{Gm\_{1}m\_{2}}{r^{2}}$ $g=\frac{Gm\_{2}}{r^{2}}$ Tx = Tcosθ Ty = Tsinθ

1. Suppose a planet has six times the mass of Earth and three times the radius. The acceleration due to gravity on this planet would be \_\_\_\_\_\_\_ that of Earth’s.

 A. 54 times B. 2 times

 C. 18 times D. 2/3

2.  (2 points FBD, 1 point equation rearranged for v, 4 points answers, 1 point units)

Determine the orbital velocity and orbital period (T) of a satellite at a location of 1.2 x 107 m above the surface of the earth. (mass and radius of Earth are given above). Report your answer for orbital period in days as well as in seconds. Start by finding the orbital radius.

3. (2 points FBD, 1 point equation rearranged for v, 4 points answers, 1 point units)

Find the maximum speed allowed for a 920.-kg car to round a traffic circle with a radius of 26.8 m at two different road conditions. In normal conditions, $µ\_{s}$ = 0.6. In icy conditions, $µ\_{s}$= 0.3.

4. (4 points)

The Galilean moons are the four [moons](http://en.wikipedia.org/wiki/Natural_satellite) of [Jupiter](http://en.wikipedia.org/wiki/Jupiter) discovered by [Galileo Galilei](http://en.wikipedia.org/wiki/Galileo_Galilei) around January 1610. They

are by far the largest of the [moons of Jupiter](http://en.wikipedia.org/wiki/Moons_of_Jupiter) and derive their names from the lovers of Zeus: *Io, Europa*, *Ganymede, and Callisto*.

g (the gravitational field strength) on Io is 2.7 times stronger than g on Pluto’s surface. Io’s radius is 1.6 times larger than Pluto’s. How many times larger or smaller is Io’s mass? An “mrg” chart may be helpful. Be specific about whether the mass is larger or smaller.

5. (4 points) How high above Earth’s surface is *g* reduced to 8.80 m/s2?

6. (6 points: 2 points FBD, 1 point equation, 4 points answer, 1 point units)

Find the speed of the flying pig hanging from the ceiling and traveling in a circle with radius 0.46 m.

The mass of the pig is 0.3 kg and when it is flying the angle with the horizontal is 22 degrees.