

Homework Set #4 Solutions (9/22 - 9/26):

Chapter 5: **Questions** 24, 29, 45 **Exercises** 10, 18, 22

Questions:

24. Because the variation in the force is not usually important for motion near the Earth's surface, we use the simpler form as it gives a very good approximation.
29. We would expect the value of g to be larger because the uranium has a larger mass per cubic meter than the average surface material.
45. The Moon produces a bulge that points only toward the Moon but also away from the Moon. The Sun does the same. The effects will reinforce to produce a larger bulge as long as the individual bulges are aligned. This happens with the Moon and the Sun either on the same side of Earth or on opposite sides.

Exercises:

10. $F_{shuttle} = F_{earth} \left(\frac{r_{earth}}{r_{shuttle}} \right)^2 = F_{earth} \left(\frac{6400 \text{ km}}{6400 \text{ km} + 400 \text{ km}} \right)^2 = 0.886 F_{earth}$
18. $g_{mars} = g_{earth} \left(\frac{m_{mars}}{m_{earth}} \right) \left(\frac{r_{earth}}{r_{mars}} \right)^2 = 10 \text{ m/s}^2 \left(\frac{0.11 m_{earth}}{m_{earth}} \right) \left(\frac{r_{earth}}{0.53 r_{earth}} \right)^2 = 3.9 \text{ m/s}^2$
22. $5^2 = 25$

Chapter 6: **Questions** 6, 11 **Exercises** 4, 9

Questions:

6. Padded dashboards lengthen the time for the body to stop and therefore reduce the forces involved.
11. The initial momentum is 8 kilogram-meters per second down. It changes to zero, so the impulse is 8 kilogram-meters per second directed up.

Exercises:

4. $v_{you} = \frac{m_{18} v_{18}}{m_{you}} = \frac{(24,000 \text{ kg})(1 \text{ mph})}{60 \text{ kg}} = 400 \text{ mph}$

$$9. \quad F\Delta t = \Delta(mv) = 0 - (1500 \text{ kg})(30 \text{ m/s}) = -45,000 \text{ N} \cdot \text{s}$$

$$F = \frac{\Delta(mv)}{\Delta t} = \frac{-45,000 \text{ N} \cdot \text{s}}{8 \text{ s}} = -5625 \text{ N}$$