Answer Key

1. C $mv^2/r = GmM/r^2$ $v^2 = GM/r$ not changed
2. A $v_e = \sqrt{(2GM/r)}$ M doubles implies v_e increases by $\sqrt{2}$
3. C $M_1gR_1 = M_2gR_2$ thus $R_1 = R_2$ and $M_1 = M_2$
4. D $300N+200N-W = 0$ $W = 500N$
5. D $60g \cdot x = 30g \cdot 2+20g \cdot 3$ $x = 2m$
6. C $T = 2\pi\sqrt{(m/k)}$ m doubles implies T increases by $\sqrt{2}$
7. E $F = -kx$ none
8. D $\omega A = 30(.04) = 1.2m/s$
9. C $2\pi f = 20$ $f = 10/\pi$ Hz
10. B $½8kg \cdot v_M^2 = ½2N/m(3m)^2$ $4v_M^2 = 9$ $v_M = (3/2)$ m/s
11. A) $\boldsymbol{g_M}(P) = (-GM/x^2)\boldsymbol{i}$
    B) $\boldsymbol{g_m}(P) = (Gm/[R-x]^2)\boldsymbol{i}$
    C) $(Gm/[R-x]^2) + (-GM/x^2) = 0$ $1/(R-x)^2 = (M/m)/x^2 = (5/x)^2$ $R-x = x/5$ or $-x/5$
    $R = 6x/5$ or $4x/5$. Thus $x = 5R/6$
    D) $\boldsymbol{F}_{on\ M}/\boldsymbol{F}_{on\ m} = -1$ Newton's third