1. (10 pts) An object of mass m is threw from the ground with an initial speed v and with an angle θ relative to the level ground. How far the object will land?

2. (10 pts)
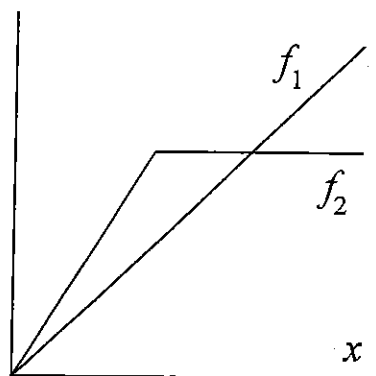
An object is pushed by a force $f_1(x)$ along the x axis as shown in the figure. Plot the work $W_1(x)$ done on the object. Do the same thing for $f_2(x)$.

3. (14 pts) An object of mass m is connected to a spring with spring constant k. Assume that $x = 0$ being the equilibrium position. With the initial condition $x(t = 0) = 1$ and $v(t = 0) = 2$, what is $x(t)$ and $v(t)$? Plot the particle trajectory on the phase plane $v - x$.

4. (14 pts)
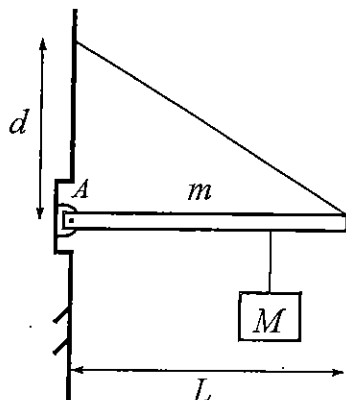
An object of mass M is hanging from a bar of mass m and length L, with a distance of $L/4$ from the end. The end of the bar is fixed on the wall by the hinge A which applies no torque. The bar is also suspended by a string as shown. What is the tension of the string? What is the force on the hinge?

5. (10 pts) A bucket is filled with water of 40 cm height. A hole is drilled on the bottom of the bucket. Using Bernoulli's principle, calculate the speed of water just flow out the hole.

注意：背面有試題

所別： 物理學系生物物理 碩士班 不分組(一般生)   共2頁 第2頁
科目： 普通物理
本科考試禁用計算器   ＊請在答案卷(卡)內作答

6. (10 pts) A heat engine is adsorbing heat at 1000 W (joule/sec) from a source at temperature $550°$ K, and dump heat at rate $\dot{Q}$ to its environment at $300°$ K. If the entropy of the heat engine remains fixed, what is $\dot{Q}$? What is the efficiency of the heat engine?

7. (12 pts) A charge $-q$ is located at $(0,0)$, two charges q located at $(0,1)$ and $(1,1)$ respectively. With A at $(1,0)$ and B at $(1,\frac{1}{2})$, what are the electric fields $\vec{E}_A$ and $\vec{E}_B$? What are the electric potential V_A and V_B?

8. (10 pts)
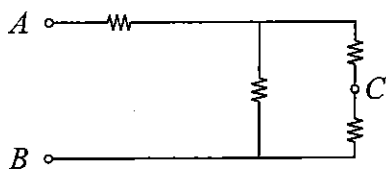
All the resistors have the same resistance of 100Ω. Assume the voltage $V_B = 3$ V and $V_A = 10$ V. What is V_C? What is the current I_C at C.

9. (10 pts)
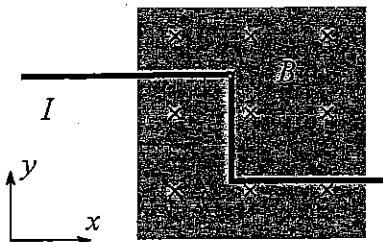
A region of magnetic field has a size $L \times L$. A wire with current I runs through the region as shown, with the vertical segment at length $L/2$. What is the magnetic force $\vec{B}$ acting on the wire?

注意：背面有試題