Name:

Physics 12
M. Lam

Graphical Analysis II

Block:

For each scenario described below, use the data to:

a) Plot the data points. Clearly scale and label all axes, including units as appropriate. Draw a curve that best represents the data.
b) Record any quantities that should be graphed to yield a straight line.
c) Plot the straight line data points. Clearly scale and label all axes, including units as appropriate. Draw a straight line that best represents the data.
d) State the relationship between the variables. Write an equation for your straight line.
e) Determine the slope of your straight line (include units).
f) Determine the meaning of the slope of your straight line. If possible, determine the theoretical value (include units).

1. A rock is dropped from different heights. For each height, the speed at which the rock hits the ground is recorded.

Height, *h* (m)	0.40	0.60	1.00	1.50	2.00	2.50
Velocity, *v* (m/s)	2.60	3.40	4.20	5.30	6.20	6.80

2. A rock is dropped from the second floor window. The displacement of the rock is recorded at various times.

Time, *t* (s)	0.20	0.40	0.60	0.80	1.00	1.20
Displacement, *d* (m)	0.19	0.75	1.74	3.08	4.80	6.84

3. Various objects are pulled along a horizontal frictionless surface with a constant 2.0 N force. For each object, the mass and acceleration are recorded.

Mass, *m* (kg)	0.20	0.40	0.50	1.00	1.50	2.00
Acceleration, *a* (m/s^2)	9.5	5.0	4.2	1.9	1.3	0.9

4. A net force of 8.0 N is used to push a 20 kg object initially at rest. The speed of the object is recorded at various times.

Time, *t* (s)	1.0	1.5	2.4	4.0	5.0	5.5
Speed, *v* (m/s)	0.3	0.5	1.0	1.7	2.0	2.1

5. Various 1000 kg cars are test driven. For each car, the power and time taken reach a speed of 20 m/s are recorded.

Power, P (kW)	40	45	50	55	60	65
Time, t (s)	5.2	4.4	4.2	3.6	3.3	3.1

6. A block is given an initial speed and then allowed to slide up a frictionless ramp. The maximum height reached by the block is recorded for each trial.

Initial Speed, v_i (m/s)	1.0	2.0	3.0	4.0	5.0	6.0
Height, h (m)	0.05	0.21	0.42	0.80	1.24	1.82

7. A car goes around various circular tracks of different size. The coefficient of friction between the tires of the car and the road is the same for each of the tracks. The maximum track speed is recorded for each track. *Can you determine the coefficient of friction?*

Track radius, r (m)	250	300	350	400	450	500
Maximum speed, v_{max} (m/s)	43	47	51	54	56	61

8. An 80 kg astronaut leaves Earth for a mission. The gravitational force he experiences is measured at various distances from the centre of Earth.

Distance, r ($\times 10^6$ m)	7	8	10	12	15	20
Gravitational force, F_g (N)	650	500	320	220	140	80

9. A 60 W light source is positioned on a stand and the brightness at various distances from the light source is measured. *You may use the equation $B=L/4\pi d^2$, where B is the brightness measured, L is the luminosity and d is the distance from the light source.*

Distance, d (m)	0.20	0.30	0.40	0.50	0.60	0.70
Brightness, B (W/m^2)	116	50	25	18	11	8

10. A newly discovered planet is found to have multiple moons in circular orbits. The orbital period and radius are measured for each of these planets. *Can you determine the mass of the planet?*

Orbital radius, r ($\times 10^9$ m)	0.33	0.54	0.82	1.02	1.35	1.46
Orbital period, T ($\times 10^6$ s)	1.70	3.08	6.33	8.41	12.60	14.06