


## Quiz 2

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

Total = 10 marks

1. (2 marks) What is the paraxial ray approximation and why is it useful?



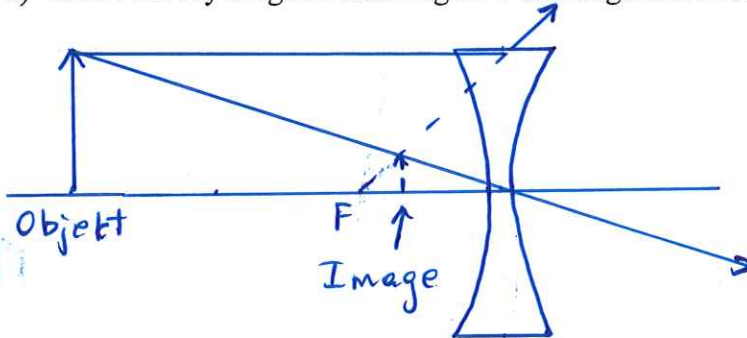
Ray travels nearly parallel to optical axis.  
 $\Rightarrow \theta$  is small so we can approximate  $\sin \theta \approx \theta$

2. (4 marks) Derive the equation relating the object distance  $s_o$ , image position  $s_i$  and focal length  $f$  for a convex lens.

See lecture notes.

3. (4 marks) Consider a 1 cm high object at a position 30 cm in front of a diverging lens with focal length 10 cm.

a) Draw the ray diagram showing how an image is formed.



b) Find the image location.

$$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$$

$$\frac{1}{30} + \frac{1}{s_i} = \frac{-1}{10}$$

$$s_i = -7.5 \text{ cm}$$

$f < 0$  for diverging lens.

$s_i < 0$  for virtual image

c) Find the image height.

$$\frac{y_i}{y_o} = \frac{s_i}{s_o}$$

$$y_i = 1 \cdot \frac{7.5}{30} = 0.25 \text{ cm.}$$

d) Describe the image orientation.

Image is erect.