

**CE 3202 Spring 2011 Exam 2**

Name \_\_\_\_\_

Closed Book; Closed Notes

(2) 3"x5" Note Cards Allowed;

Scientific Calculator Allowed (Graphing Calculators are Banned)

100 points are possible

Answer all questions to the best of your ability. State any assumptions you feel are necessary.

Attach extra sheets, if used. **Show your work!**

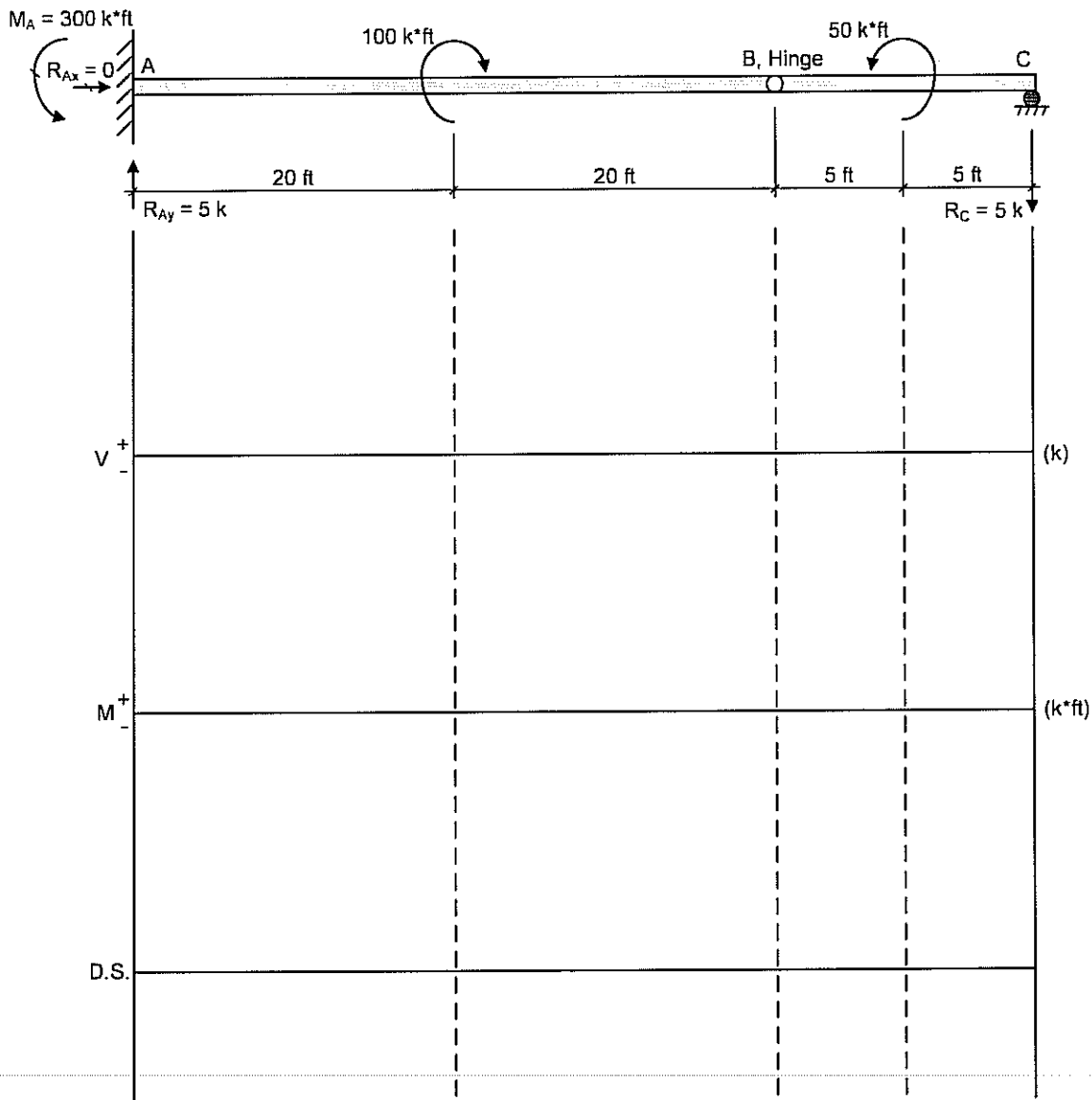
**Problem 1. Shear and moment diagrams.**

For the structure shown (the reaction are given to you):

(a) Draw the shear diagram (5 points).

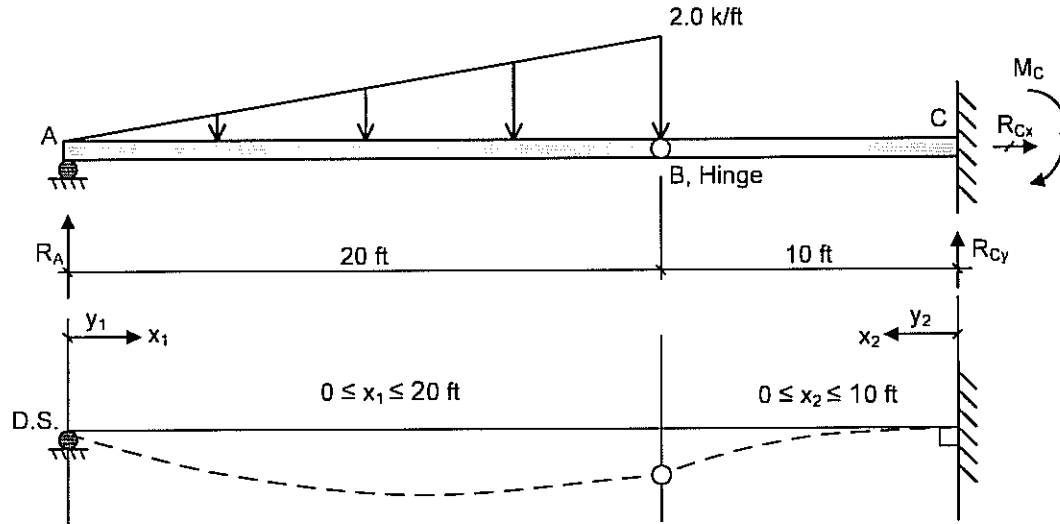
(b) Draw the moment diagram (10 points).

(c) Sketch the approximate deflected shape pointing out any inflection points (5 points).



**Problem 2. The double integral method.**

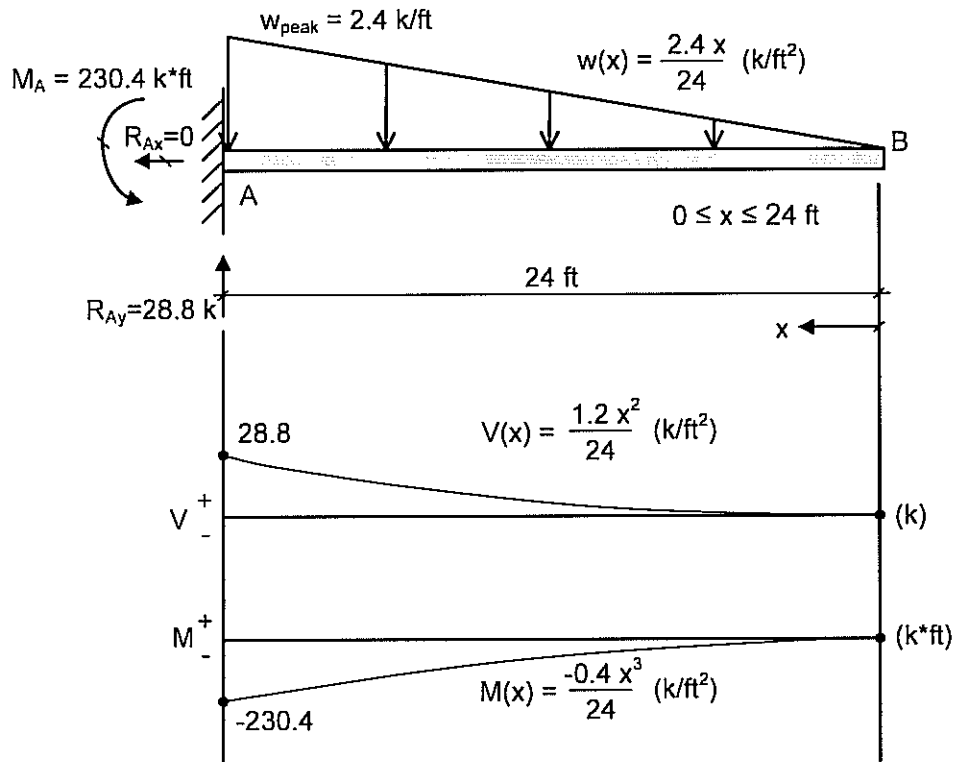
For the structure below, provide (4) boundary condition equations that you might use to solve for constants of integration using the double integral method to derive the elastic curve. Do not solve for the elastic curve, only state the boundary conditions. Use the  $x_1$  and  $x_2$  coordinates given to you (20 points).



**Problem 3. Moment-area method.**

For the structure shown below, compute the vertical deflection at point B using the moment-area method.  $E$  and  $I$  are constant:  $E = 30,000 \text{ kips/in}^2$  and  $I = 400 \text{ in}^4$  (30 points).

Table 3 from the text may be very helpful. A copy of it is attached to the back of this exam.



**Problem 4. Method of Virtual Work**

For the structure from Problem 3 (reproduced below), find the vertical deflection at point B using the method of virtual work. Moment equations for two potentially helpful beams under unit loads are given.  $E$  and  $I$  are constant:  $E = 30,000$  kips/in<sup>2</sup> and  $I = 400$  in<sup>4</sup> (30 points).

Moment equations for the real loading system are given to you.

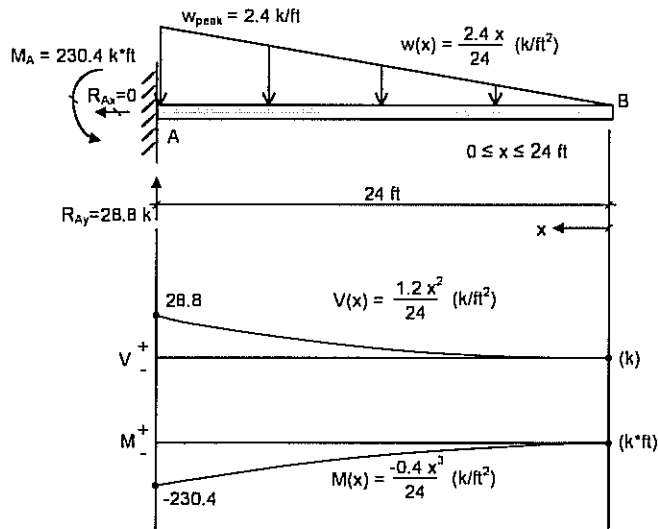
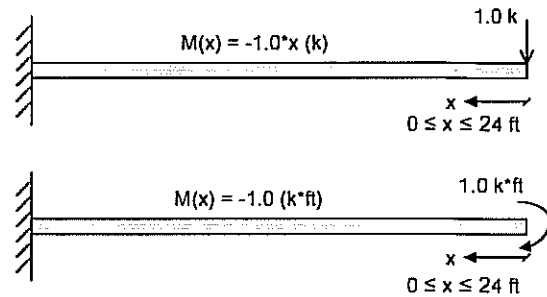
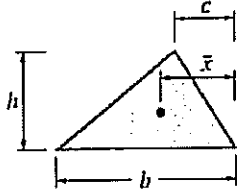
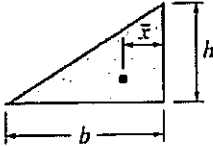
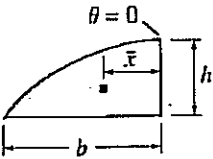
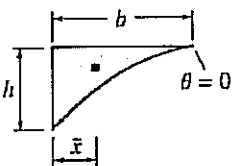
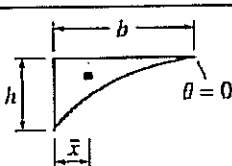
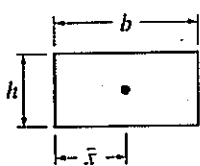
**Potentially helpful beams**

Table 3 from course text (Leet, et al., 2010).

It may be helpful to you to remove this page from the back of the exam. Doing so is permitted.

Table 3: Properties of Areas

Shape	Figure	Area	Centroidal Distance $\bar{x}$
(a) Triangle		$\frac{bh}{2}$	$\frac{b+c}{3}$
(b) Right triangle		$\frac{bh}{2}$	$\frac{b}{3}$
(c) Parabola		$\frac{2bh}{3}$	$\frac{3b}{8}$
(d) Parabola		$\frac{bh}{3}$	$\frac{b}{4}$
(e) Third-degree parabola		$\frac{bh}{4}$	0.2b
(f) Rectangle		bh	$\frac{b}{2}$