ENDS 231: Practice Quiz 10

*Note: A one page (one sided) crib sheet is allowed during the quiz, along with a silent, **non-programmable** calculator.*

Clearly show your work and answer.

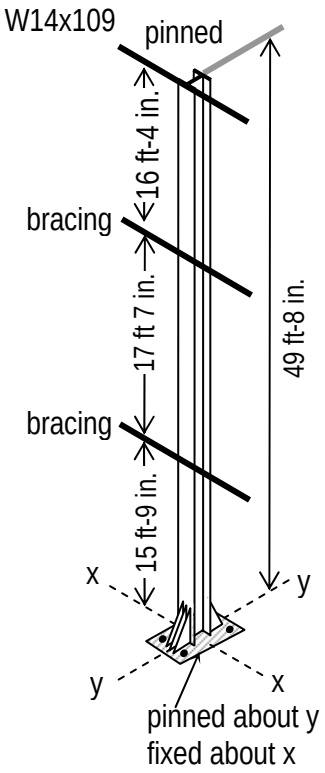
A 49 ft 8 in. tall W14x109 column in a three story frame building of A992 steel (F_y = 50 ksi) is braced in the weak axis (y-y) at 15 ft 9 in. and 33 ft 4 in. from the base and at the top. The top is pinned while the bottom is pinned about the y axis and fixed about the x axis. Because there is an atrium space, the column is not braced in the strong axis (x-x). The cross section has the properties:

$A = 32.0\ in^2$	$E = 29 \times 10^3$ ksi
$I_x = 1240\ in^4$	$r_x = 6.22$ in
$I_y = 447\ in^4$	$r_y = 3.73$ in

a) Find the critical allowable stress.

b) If the column is to support 450 k, is it adequate for Allowable Stress Design?

c) *[some short question from the text material]*



Allowable stress with F_y = 50 ksi

$\frac{KL}{r}$	F_a (ksi)
51	24.19
52	24.04
53	23.88
54	23.72
55	23.55
56	23.39
57	23.22
58	23.06
59	22.89
60	22.72
61	22.55
62	22.37
63	22.20
64	22.02
65	21.85
66	21.67
67	21.49
68	21.31
69	21.12
70	20.94
71	20.75
72	20.56
73	20.38
74	20.10
75	19.99
76	19.80
77	19.61
78	19.41
79	19.21
80	19.01
81	18.81
82	18.61
83	18.41
84	18.20
85	17.99
86	17.79
87	17.58
88	17.37
89	17.15
90	16.94
91	16.72
92	16.50
93	16.29
94	16.06
95	15.84
96	15.62
97	15.39
98	15.17
99	14.94
100	14.71

Answers:

a) $F_a \approx 21.49$ ksi (by strong axis, $F_{a\text{-weak}} \approx 23.3$ ksi)
b) OK (P_a = 688 k)

Disclaimer: Answers have NOT been painstakingly researched.