Section 1.10
Solutions and Hints

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for the book:

<u>Precalculus, Mathematics for Calculus 4th Edition</u>
by James Stewart, Lothar Redlin and Saleem Watson.

20. Find the equation of the line through (-1, -2) and (4, 3)

Slope = rise / run = (y2 – y1) / (x2 – x1) = (3 - -2) / (4 - -1) = 5 / 5 = 1

The use point-slope form:
(y – y1) = m(x – x1)
(y - -2) = 1*(x - -1)
y + 2 = x + 1
y = x – 1 ← some profs always want y = mx + b form
OR
y – x + 1 = 0← others want general form

32. Find the equation of the line through (½, -2/3) and perpendicular to the line: 4x – 8y = 1

First find the slope of 4x – 8y = 1 (I suggest putting it in slop-intercept form)

4x – 8y = 1 → -8y = 1 – 4x
→ y = (1 – 4x) / -8
→ y = -⅛ + ½ x

So the slope of the given line is –⅛, we want ours to be perpendicular so we will use the negative reciprocal which is 8/1 or just 8. Put this into the equation for point slope form:

(y – y1) = m(x – x1)
(y – ½) = 8*(x - -2/3)
y – ½ = 8x + 16/3
y = 8x + 35/6 ← slope-intercept form
OR
y – 8x – 35/6 = 0 ← general form

52. Show that A(-3, -1), B(3, 3) and C(-9, 8) are vertices of a right triangle.

To do this you must show that one of the angles of the triangle is 90°.
You may want to sketch the points to see which angle it is likely to be.
Or you will need to check all three angles. I will examine all three angles.

The angle at point B is defined by the line segments BA and BC

We therefore need the slope of the line through BA and the slope of the line through BC. If the angle is 90° then the slopes will be negative reciprocals of one another.

Slope BA = (-1 –3) / (-3 – 3) = -4 / -6 = 2 /3
Slope BC = (8 – 3) / (-9 – 3) = 5 / -12 = -5 / 12
2/3 and –5/12 are NOT negative reciprocals so this angle is not 90°.

The angle at point C is defined by the line segments CA and CB

Slope CA = (-1 – 8) / (-3 - -9) = -9/6 = -2/3
Slope CB = (3 – 8) / (3 - -9) = -5 / 12 = -5 /12 *(same as for BC)*

The angle at point A is defined by the line segments: AB and AC

Slope AB = (3 – -1) / (3 - -3) = 4 / 6 = 2/3
Slope AC = (8 - -1) / (-9 - -3) = 9 / -6 = -3/2
2/3 and –3/2 ARE negative reciprocals so this angle is not 90°

Thus there is a 90° angle at point A so the triangle must be a right triangle.

65. Biologists have observed the chirping rat of crickets of a certain species is related to temperature and the relationships appears to be very near linear. A cricket produces 120 chirps per minute at 70° F and 168 chirps per minute at 80° F.

65 a. Find the linear equation that relates the temperature T and the number of chirps per minute N.

In this problem you are given 2 points. We will let temperature be marked on the x-axis and the chirps per minute be on the y-axis. So the 2 points are:
(70° , 120 chirps) and (80° , 168 chirps)

Notice this is in (T, N) form. The books solution is in (N, T) form. This is NOT a problem, the solutions are equivalent – the graphs will be different.

To get an equation for this first calculate the slope, m, of the line through the points and then use the point-slope form, (N – N1)= m*(T – T1), to find the line.

slope = m = (168 – 120) / (80 – 70) = 4.8
So the equation is:
N – 120 = 4.8*(T – 70)
N – 120 = 4.8*T – 336
N = 4.8*T – 216
Note you could also solve this for T and get 4.8T = N + 216
or rather **T = (5/24)*N + 45**

65 b. If the crickets are chirping at 150 chirps per minute, estimate the temperature.

Notice in part (a) we already have T as a function of N. So all we need to do is plug 150 in for N:

T = (5/24)*N + 45 → T = (5/24)*150 + 45
T = 305/4° F
T = 76.25° F