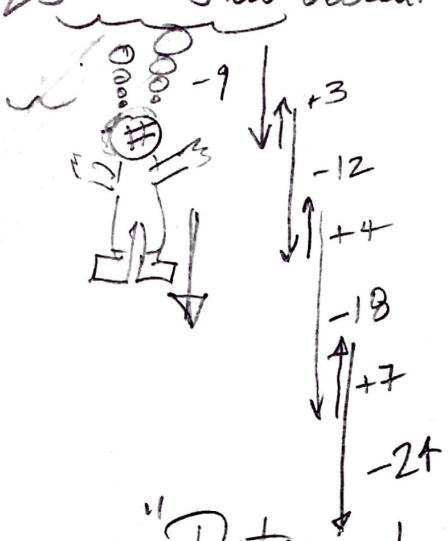
Chapter 2, #25

2.25 Slow descent



$\Delta y =$ $-9.0\,m$
$+3.0\,m$
$-12.0\,m$
$+4.0\,m$
$-18.0\,m$
$+7\,m$
$-24.0\,m$

$\vec{r} = -49\,m\,\hat{j}$

or 49 m "below surface"

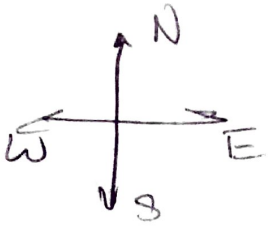
or 49 m "down"

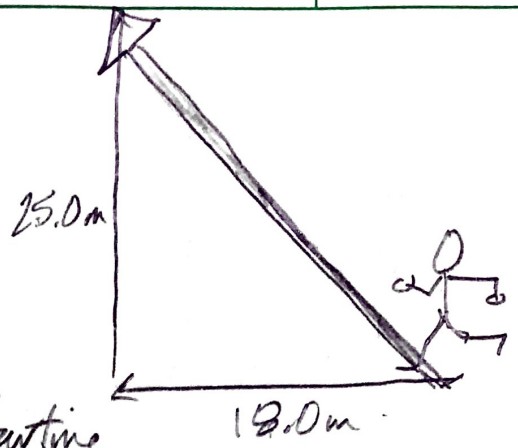
"Distance to the boat" is the scalar version, the magnitude of the vector:

49 m

Chapter 2, #27

2.27





Find magnitude & direction from starting point, graphically.

To do this properly, I'd need to carefully scale the vectors, & use a protractor & ruler to measure the resultant.
I don't have those available to me right now, so I'm going to estimate, & then solve using trig to check my results.

Magnitude = between $18\sqrt{2}$ & $25\sqrt{2} \approx 20\sqrt{2} =$ 28 m

Angle = a little less than 135 $\approx$ 130°

Estimated

Actual values (calculated) = 30.8 m @ 126°

$\sqrt{18^2 + 25^2}$ = 30.8

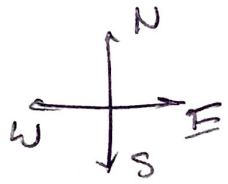
$180 - \tan^{-1}\left(\frac{25}{18}\right) = 126°$

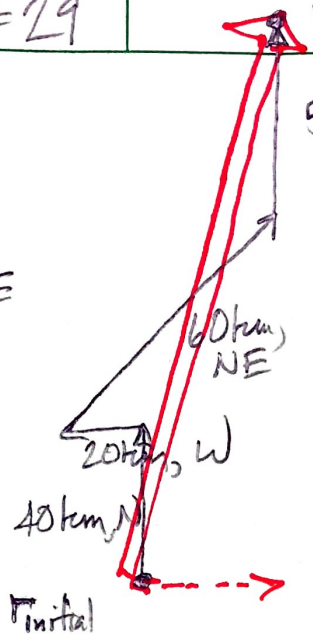
Pretty close!!

(:)

Chapter 2, #29

2.29





Net displacement graphically?

Again, without ruler or protractor, I'll estimate using the tip of my pencil as a scale.

75 km @ 80°

estimated as "somewhat less than 90°.

Should have estimated double this = 150 km

Actual calculated result?

0 − 20 + 60 cos 45 = 22.4

$\Delta x =$ ~~[illegible]~~

$\Delta y =$ ~~[illegible]~~

40 + 0 + 60 sin 45 + 50 = 132

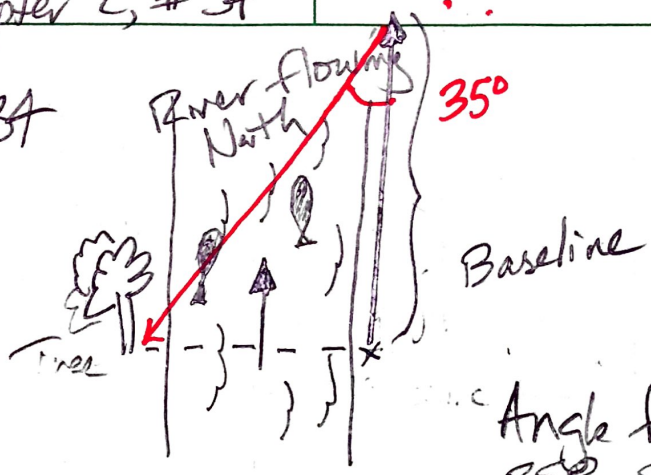
$\Delta r = \sqrt{r_x^2 + r_y^2} = 134$ km

$\tan^{-1}\left(\frac{r_y}{r_x}\right) = 80.4°$

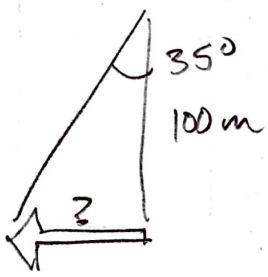
These calculated values are pretty close to my estimated values!

Chapter 2, #34

2.34



Angle from baseline to tree is 35°, & baseline = 100 m.



Using trig:

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

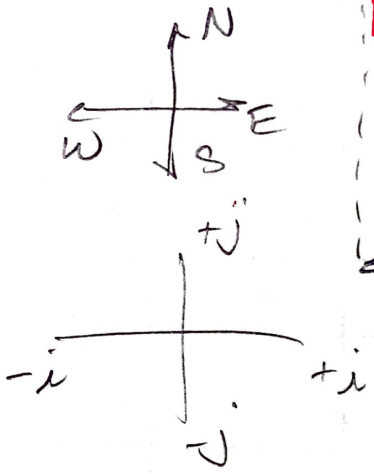
$\tan 35 = \frac{\text{river width}}{100}$

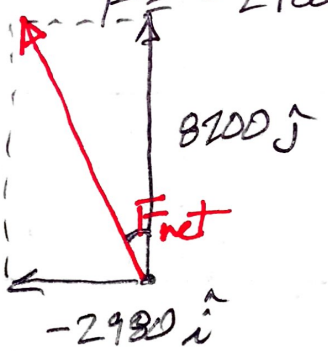
river width $= 100 \tan 35$

$= \boxed{70\text{ m}}$

Chapter 2, #40

2.40





$\vec{F} = -2980\,\hat{i} + 8200\,\hat{j}\ N$

$$F_{net} = \sqrt{F_i^2 + F_j^2}$$

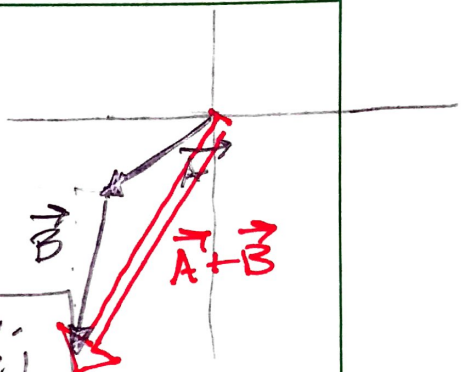
$$= \sqrt{(-2980)^2 + (8200)^2}$$

$$= \boxed{8725\ N}$$

$$\text{Direction} = \tan^{-1}\left(\frac{F_x}{F_y}\right) + 90 = \boxed{110^\circ}$$

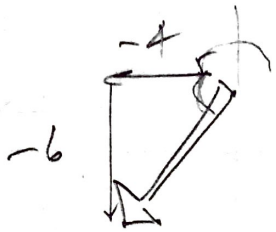
Ch 2, #47

2.47 $\vec{B} = -i - 4j$ & $\vec{A} = -3i - 2j$



a) $\vec{A} + \vec{B} = ?$

$(-3i - 2j) + (-i - 4j) = \boxed{-4i - 6j}$



$mag = \sqrt{6^2 + 4^2} = \boxed{7.2}$

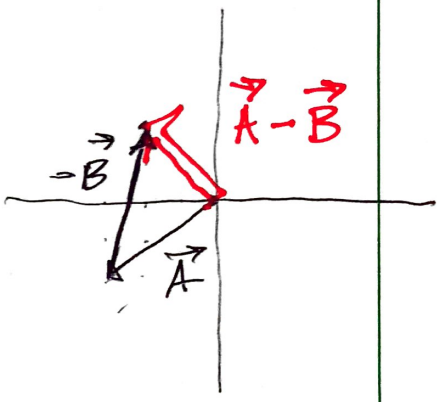
$dir = 180 + \tan^{-1}\left(\frac{6}{4}\right) = \boxed{236°}$

b) $\vec{A} - \vec{B}$ $(= \vec{A} + -(\vec{B}))$

$(-3i - 2j) - (-i - 4j)$

$-3i + i \quad -2j + 4j$

$\boxed{-2i + 2j}$

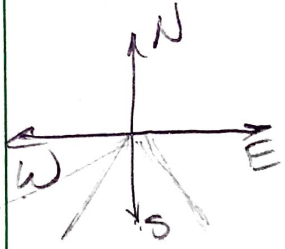


$mag = \sqrt{2^2 + 2^2} = \boxed{2.83}$

$dir = 90 + \tan^{-1}\left(\frac{2}{2}\right) = \boxed{135°}$

Chapter 2, #51

2.51



km

$r_1 = 2.5 \angle 135° = 2.5\cos 135 + 2.5\sin 135$
$= -1.77\hat{i} + 1.77\hat{j}$

$r_2 = 4.7 \angle -60° = 2.35\hat{i} + -4.07\hat{j}$

$r_3 = 1.3 \angle 205° = -1.18\hat{i} + -0.55\hat{j}$

$r_4 = 5.1 \angle 0° = 5.1\hat{i} + 0\hat{j}$

$r_5 = 1.7 \angle 85° = 0.15\hat{i} + 1.69\hat{j}$

$r_6 = 7.2 \angle 235° = -4.12\hat{i} + -5.90\hat{j}$

$r_7 = 2.8 \angle 10° = 2.76\hat{i} + 0.49\hat{j}$

$3.29\hat{i} + -6.57\hat{j}$

$M_{cg} = \sqrt{3.29^2 + 6.57^2}$

$= \boxed{7.35 \text{ km}}$

$\theta = \tan^{-1}\left(\frac{-6.57}{3.29}\right)$

$= \boxed{-63.4°}$