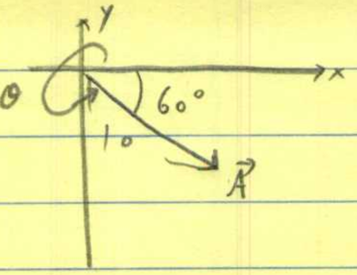
#1.



The Standard position angle θ of $\vec{A}$ is 300° (=360° − 60°)

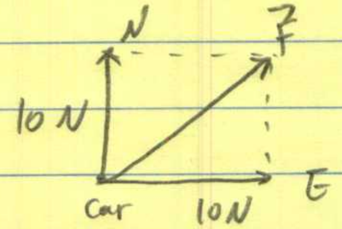
$$A_x = 10 \cos 300° = 10 \cos(2\pi - \tfrac{\pi}{3}) = 10 \cos\tfrac{\pi}{3} = 5$$

$$A_y = 10 \sin 300° = 10 \sin(2\pi - \tfrac{\pi}{3}) = -10 \sin\tfrac{\pi}{3} = -5\sqrt{3}.$$

If we write the length 1 vector in the positive x- and y- axis direction by $\hat{e}_x$ and $\hat{e}_y$,

$$\underline{\vec{A} = 5\hat{e}_x - 5\sqrt{3}\,\hat{e}_y}$$

#2.



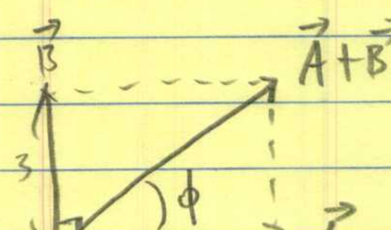
Step 1. B and B's wife are applying the force $\vec{F}$

$\vec{F}$ has length $10\sqrt{2}$ (pytagorean thm)

with angle $45° \left(= \frac{\pi}{4} = \tan^{-1}\left(\frac{10}{10}\right)\right)$

Step 2. Note that B's two kids are applying forces $10\sqrt{2}$ N total to the southeast. From this, notice that this force will Cancel the force applied by B's wife, and its X-component is equal to the force of B. Hence <u>20 N of force to the East</u>

#3.

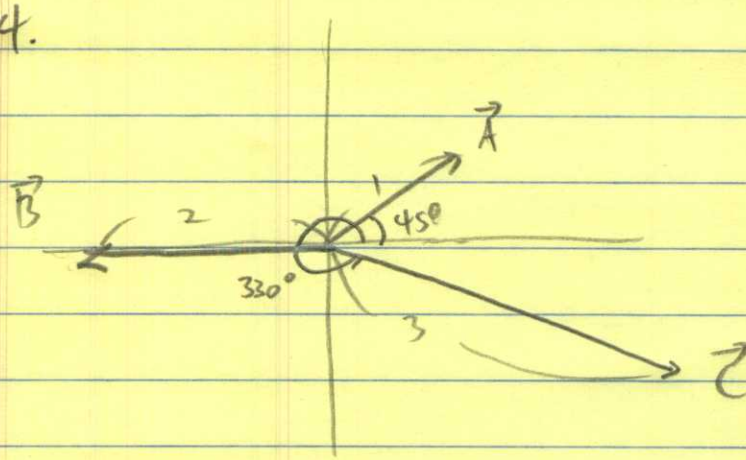


$A+B = 5$ (pytagorean thm)

the angle $\phi = \tan^{-1}\frac{3}{4} = 36.87°$

Hence $5 \angle 36.87°$

#4.



	x - component	y - component
$\vec{A}$	$1 \cdot \cos 45° = \frac{\sqrt{2}}{2}$	$1 \cdot \sin 45° = \frac{\sqrt{2}}{2}$
$\vec{B}$	$2 \cdot \cos 180° = -2$	$2 \cdot \sin 180° = 0$
$\vec{C}$	$3 \cdot \cos 330° = 3\cos 30° = \frac{3\sqrt{3}}{2}$	$3 \cdot \sin 330° = -3\sin 30° = -\frac{3}{2}$

Let $\vec{F} = \vec{A} + \vec{B} + \vec{C}$ $\quad F_x \overset{\text{calculator}}{=} 1.31 \quad F_y \overset{\text{calculator}}{=} -0.79$

$$\sqrt{F_x^2 + F_y^2} \underset{\text{Calculator}}{=} 1.53$$

$$\text{Angle} = \tan^{-1}\left(\frac{F_y}{F_x}\right) = -31.09°$$

Hence $\underline{1.53 \angle 328.91°}$

#5. $2x - 6xi^3 - 3i^2 = yi - y + 7i^5$

$\Leftrightarrow 2x + 3 + 6xi = -y + (y+7)i$

Real part : $2x + 3 = -y \Leftrightarrow 2x + y = -3$ …①

imaginary part : $6x = y + 7 \Leftrightarrow 6x - y = 7$ …②

From ①+② $8x = 4$. so $\underline{x = 1/2}$. plugin to ①

$2 \cdot 1/2 + y = -3$. $\underline{y = -4}$

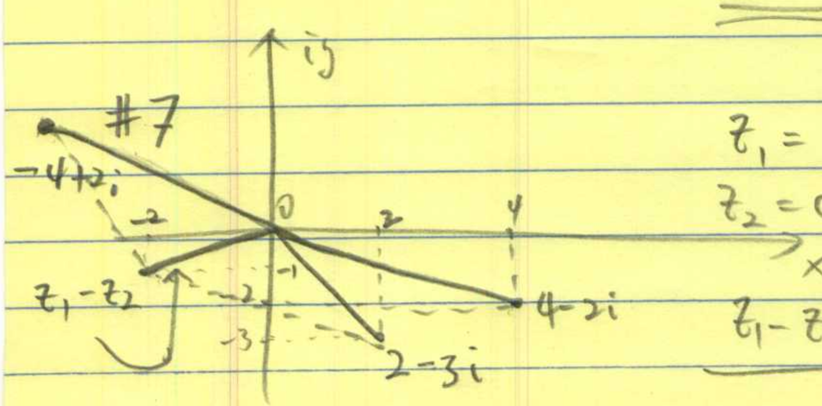
#6. $$\frac{4i}{1-i} - \frac{8+i}{2+3i} = \frac{4i(2+3i)}{(1-i)(2+3i)} - \frac{(8+i)(1-i)}{(2+3i)(1-i)}$$

$$= \frac{8i - 12 - (8 + i - 8i + 1)}{2 + 3i - 2i + 3} = \frac{-21 + 15i}{5 + i}$$

$$= \frac{(-21 + 15i)(5 - i)}{(5+i)(5-i)} = \frac{-105 + 15 + 75i + 21i}{26}$$

$$= -\frac{90}{26} + \frac{96i}{26}$$

#7



$z_1 = 2 - 3i$

$z_2 = 4 - 2i$

$\underline{z_1 - z_2 = -2 - i}$

#8 $\quad$ length $= \sqrt{(-3)^2+(4)^2} = 5$

reference angle $= \tan^{-1}\left(\frac{4}{-3}\right) = 53.13°$

so $5 \angle 126.87°$ $(= 180° - 53.13°)$

#9: First change $\frac{\sqrt{3}}{2} + \frac{1}{2}i$ into polar form

length $= \sqrt{\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2} = \sqrt{\frac{4}{4}} = 1$

reference angle $= \tan^{-1}\left(\frac{1/2}{\sqrt{3}/2}\right) = \tan^{-1}\left(1/\sqrt{3}\right) = 30°$
$\parallel$
Standard position angle
in this case

Note $\tan 30° = 1/\sqrt{3}$.

So, in polar form, the given number is
$1 \angle 30°$

$30° = \frac{\pi}{6}$

In exponential form: $1 \cdot e^{\frac{\pi}{6}i}$

#10. $i = \cos\frac{\pi}{2} + i\sin\frac{\pi}{2} = 1 \cdot e^{\frac{\pi}{2}i}$

So the modulus of all three roots are $\sqrt[3]{1} = 1$

arguments are $\dfrac{2n\pi + \frac{\pi}{2}}{3}$.

$n=0 \quad \frac{\pi}{6}$

$n=1 \quad \frac{5\pi}{6}$

$n=2 \quad \frac{9\pi}{6} \quad \frac{3\pi}{2}$

Three roots $\{e^{\frac{\pi}{6}i}, e^{5/6\pi i}, e^{3/2\pi i}\}$.