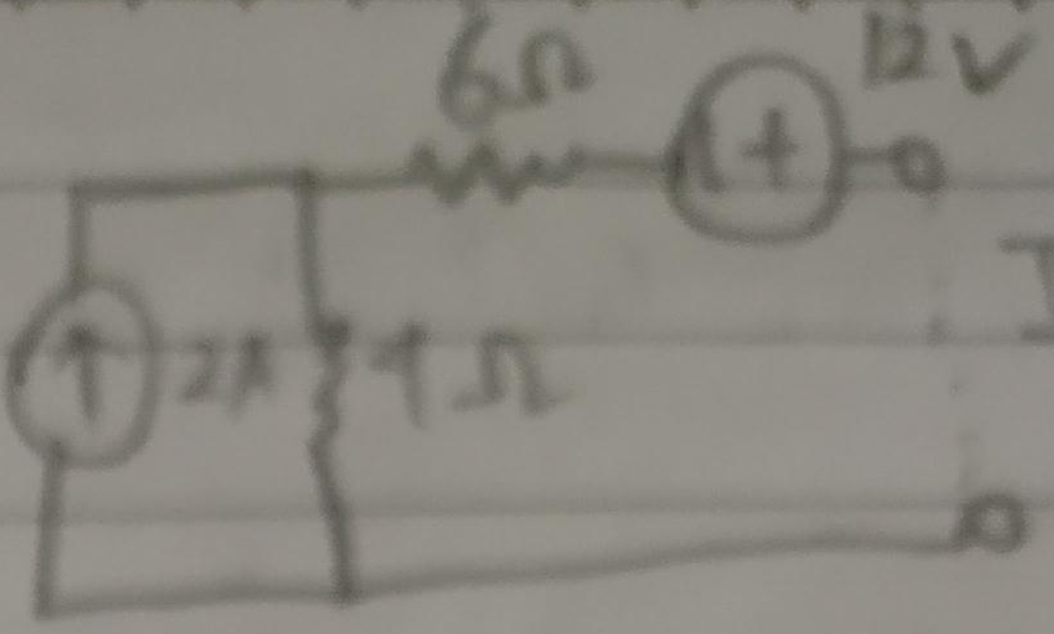
1) i) $R_N = 6+4 = 10\,\Omega$ //



We source transform 2A & 4 Ω in parallel to 8V & 4 Ω
Then use mesh to solve it

$$8 - (4+6)i + 12 = 0$$

$$i_N = 10\,A$$ //

ii) $i = 10 + 6 = 16\,A$ //

Date

2) Short circuit R then do mesh analysis

$20 - 3i - 2i + 10 - 5(i-6) = 0$

$i = 6A$

$R_{th} = (3+5) // 2 = 1.6\,\Omega$ //

$V_{th} = -2i + 10 = -12 + 10 = -2V$ //

i) R_L must be equals to R_{th} for P_{max}

$R = 1.6\,\Omega$ //

ii) $P_{max} = \frac{V_{th}^2}{4R_{th}} = \frac{(-2)^2}{4(1.6)} = 0.625\,W$ //

3) $3\times10^{-3} = \frac{V_1-(-3V_0)-V_2}{2000} + \frac{V_1-V_2}{4000}$ — ①

$\frac{V_1-(-3V_0)-V_2}{2000} + \frac{V_1-V_2}{4000} = \frac{V_0}{1000}$ — ②

$V_2 = V_0$ — ③

so,

$3V_1+3V_2 = 12$ — ①

$3V_1 - V_2 = 0$ — ②

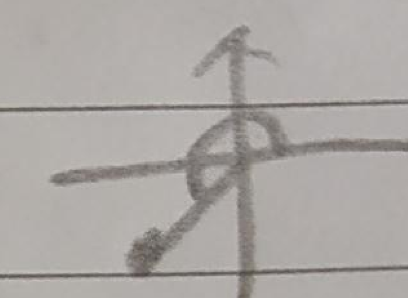
When solved $V_1 = 1V$, $V_2 = 3$ //

4) i) $r = \sqrt{(2\sqrt{3})^2 + 2^2} = 4$

$\theta = \tan^{-1} \frac{2}{2\sqrt{3}} = 30^\circ$

Polar: $4 \angle 30^\circ$ // Euler: $4e^{j(30)}$ //

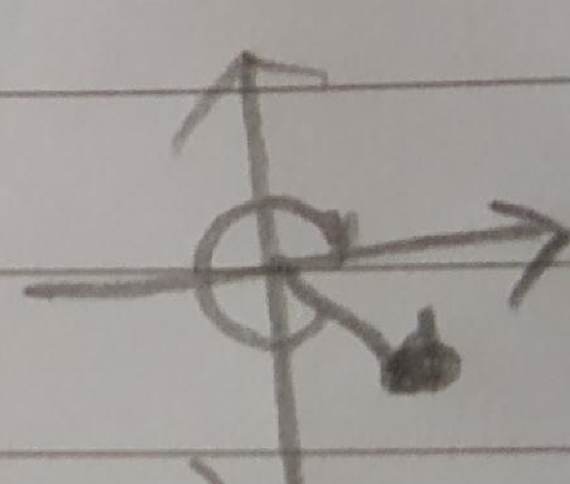
ii) $r = \sqrt{(-6)^2 + (-6)^2} = 3\sqrt{8}$



$\theta = \tan^{-1} \frac{-6}{-6} = 45^\circ$ (but coord, so $+180^\circ$)

Polar: $3\sqrt{8} \angle 225^\circ$ // Euler: $4e^{j(225^\circ)}$ //

iii) $r = \sqrt{(5)^2 + (-5\sqrt{3})^2} = 10$



$\theta = \tan^{-1} \frac{5\sqrt{3}}{5} = 60^\circ$ (we do $360^\circ - 60^\circ$)

Polar: $10 \angle 300^\circ$ // Euler: $10e^{j(300^\circ)}$ //

5) i) $(8\times4 - (-3)\times6) + (8\times6 + (-3)\times4)j$

$= 50 + 36j$ //

ii) $\dfrac{[3\times8 + 5(-2)] + [5\times8 - 3(-2)]j}{8^2 + (-2)^2}$

$= \dfrac{14 + 46j}{68} = \dfrac{7}{34} + \dfrac{23}{34}j$ //

iii) $\dfrac{1}{2-3\sqrt{3}j} \cdot \dfrac{2+3\sqrt{3}j}{2+3\sqrt{3}j}$

$= \dfrac{2+3\sqrt{3}j}{31}$

$= \dfrac{2}{31} + \dfrac{3\sqrt{3}}{31}j$ //