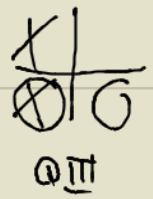
2. $\csc A = -\sqrt{7}$, $\sec A < 0$

$\csc\theta = \frac{-\sqrt{7}}{1}$



QIII

- $\sin\theta = \frac{-1}{\sqrt{7}}$ $\quad \sin\theta = -\frac{\sqrt{7}}{7}$ $\quad \cos\theta = \frac{-\sqrt{42}}{7}$

$\sin A = -\frac{\sqrt{7}}{7}$

So $y = -\sqrt{7}$, $r = 7$

$x^2 + y^2 = r^2$

$x^2 + (-\sqrt{7})^2 = 7^2$

$x^2 + 7 = 49$

$x^2 = 49 - 7$

$x^2 = 42$

$x = \pm\sqrt{42}$

$x = -\sqrt{42}$

a) $\sin(2\theta) = 2\sin\theta\cos\theta$

$= 2\left(-\frac{\sqrt{7}}{7}\right)\left(-\frac{\sqrt{42}}{7}\right)$

$= \frac{2\sqrt{7\cdot 42}}{49}$

$= \frac{2\sqrt{7\cdot 7\cdot 6}}{49}$

$\frac{2\cdot 7\sqrt{6}}{49}$

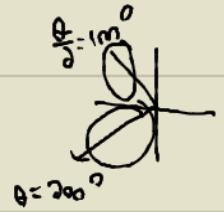
$\frac{2\sqrt{6}}{7}$

b) $\cos(2\theta) = \cos^2\theta - \sin^2\theta$

$= \left(-\frac{\sqrt{42}}{7}\right)^2 - \left(-\frac{\sqrt{7}}{7}\right)^2$

$= \frac{42}{49} - \frac{7}{49} = \frac{35}{49} = \frac{5}{7}$

c) $\sin\frac{A}{2}$



$\frac{A}{2} = 100^\circ$

$\sin\frac{A}{2} = \sqrt{\frac{1-\cos A}{2}}$

$= \sqrt{\frac{1-\left(-\frac{\sqrt{42}}{7}\right)}{2}}$

$= \sqrt{\frac{1+\frac{\sqrt{42}}{7}}{2}}$

$= \sqrt{\frac{7+\sqrt{42}}{14}}$

$= \frac{\sqrt{7+\sqrt{42}}}{\sqrt{14}}$

$= \frac{\sqrt{14}(7+\sqrt{42})}{14}$

d) $\cos\frac{A}{2} = -\sqrt{\frac{1+\cos A}{2}}$

$= -\sqrt{\frac{1+\left(-\frac{\sqrt{42}}{7}\right)}{2}}$

$= -\frac{\sqrt{14}(7-\sqrt{42})}{14}$