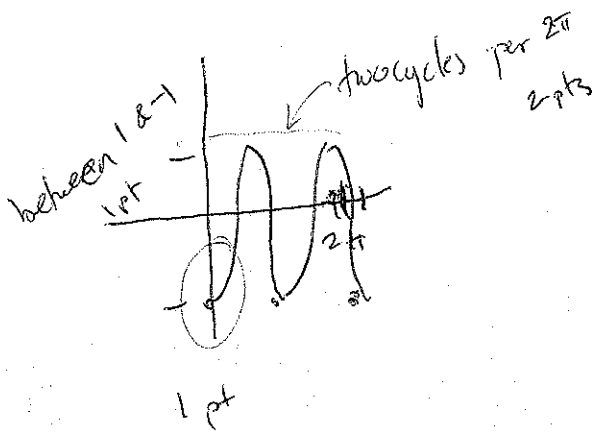Answer the following three problems. Calculators are not allowed. Justify your work where appropriate.

Problem 1, 4 points: Sketch the graph of

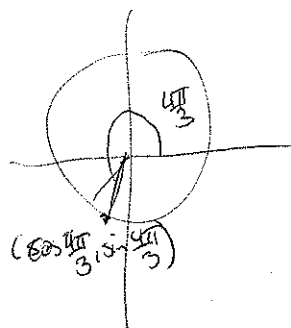$$\cos(2(\theta - \pi/2))$$

over $[0, 2\pi]$.

two cycles per 2π
2 pts

between 1 & -1
1 pt

1 pt

$\cos(-\pi) = -1$

$\cos(\pi) = -1$

$\cos 0 = 1$

$\cos(3\pi) = -1$

0

π

2π

$\frac{\pi}{2}$

2π

Problem 2, 3 points: Let $f(x) = \frac{1}{x^2+1}$ and $g(x) = \frac{1}{x^2}$. Calculate the composite functions $f \circ g$ and $g \circ f$ and determine their domains.

$$f \circ g(x) = f\left(\frac{1}{x^2}\right) = \frac{1}{\left(\frac{1}{x^2}\right)^2 + 1} = \frac{1}{\frac{1}{x^4}+1} \qquad D: \{x \in \mathbb{R} : x \neq 0\}$$

$$g \circ f(x) = g\left(\frac{1}{x^2+1}\right) = (x^2+1)^2 \qquad D: \mathbb{R}$$

Problem 3, 3 Points: Compute $\sin^{-1}\left(\sin\left(\frac{4\pi}{3}\right)\right)$.

$\sin \frac{4\pi}{3} = -\frac{\sqrt{3}}{2}$ from the unit circle.

$\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ has to be an angle between $-\frac{\pi}{2}$ and $\frac{\pi}{2}$

So it has to be $\boxed{-\frac{\pi}{3}}$