$$y = (x^2+1)^{\frac{1}{4}}$$

$$\frac{dy}{dx} = \frac{1}{4}(x^2+1)^{\frac{1}{4}-1} \times 2x$$

$$\frac{dy}{dx} = \frac{x}{2}(x^2+1)^{-\frac{3}{4}} \quad \ldots (i)$$

$$\frac{d^2y}{dx^2} = \frac{x}{2} \times -\frac{3}{4} \times 2x (x^2+1)^{-\frac{3}{4}-1}$$

$$\frac{d^2y}{dx^2} = \frac{-3}{4} x^2 (x^2+1)^{-\frac{7}{4}}$$

$$\frac{d^2y}{dx^2} = \frac{-3x^2}{4} \times \frac{1}{(x^2+1)^{\frac{7}{4}}}$$

$$\Rightarrow \frac{d^2y}{dx^2} = \frac{-3x^2}{4(x^2+1)^{\frac{7}{4}}} \Rightarrow \begin{matrix} a=0 \\ b=4 \end{matrix} \text{ and } c = \frac{7}{4}$$

6ai) $f(x) = \frac{1}{x^3+5x}$

$$f(x) = \frac{1}{x^3+5x} \equiv \frac{1}{x(x^2+5)}$$

$$\equiv \frac{A}{x} + \frac{Bx+C}{x^2+5}$$

$$1 = A(x^2+5) + x(Bx+C)$$

$$1 = Ax^2+5A + Bx^2+Cx$$

$0x^2 = Ax^2+Bx^2$; $0x = Cx$; $1 = 5A$.

$0 = A+B$; $C = 0$; $A = \frac{1}{5}$

$B = -\frac{1}{5}$

$$f(x) = \frac{1}{x^3+5x} \equiv \frac{1}{5x} + \frac{1}{5(x^2+5)}$$

$f(x) = -\sin(x+30^\circ)$

(i) $-\sin(x+30^\circ) = 0$

$\sin(x+30^\circ) = 0$

$\sin x \cos 30^\circ + \cos x \sin 30^\circ = 0$

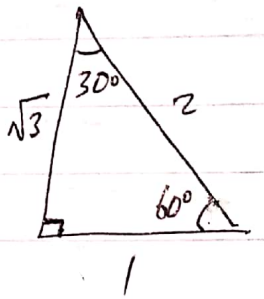
$\frac{\sqrt{3}}{2}\sin x + \frac{1}{2}\cos x = 0$

$\sqrt{3}\sin x + \cos x = 0$

$\frac{\sqrt{3}\sin x}{-\cos x} = \frac{-\cos x}{-\cos x}$

$1 = -\sqrt{3}\tan x$

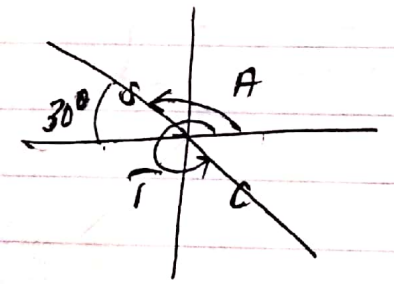
$\tan x = -\frac{1}{\sqrt{3}}$



When $x = 150^\circ$, $-\sin 180^\circ$

$x = \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

$x = -30^\circ$



$x = 150^\circ$ and 330°

(ii)