ASSIGNMENT TEST 5 SOLUTIONS

(15 MARKS)

1a) $\sec x + \tan x \equiv \dfrac{1}{\cos x} + \tan x$

question why does this become equals sign

$$= \frac{1+t^2}{1-t^2} + \frac{2t}{1-t^2} \qquad M_1 A_1$$

$$= \frac{t^2+2t+1}{1-t^2}$$

$$= \frac{(t+1)^{\cancel{2}}}{(1-t)\cancel{(1+t)}}$$

$$= \frac{t+1}{1-t} \quad \text{as required} \quad A_1$$

b) To show

$$\sec x + \tan x \equiv \tan\left(\frac{x}{4} + \frac{x}{2}\right)$$

$$\text{RHS} \equiv \tan\left(\frac{\pi}{4} + \frac{x}{2}\right)$$

$$\equiv \frac{\tan\frac{\pi}{4} + t}{1 - \tan\frac{\pi}{4} \times t}$$

$$\equiv \frac{1+t}{1-t}$$

$$\equiv \sec x + \tan x \quad \text{(part a)}$$

$$\equiv \text{LHS} \qquad \boxed{6}$$

2. a) $f'(x) = 5\cos\frac{x}{2} + \frac{11}{4}\cos\frac{x}{4} - 5\sin\frac{x}{4}$ M1, A1

$= 5\left(\cos^2\frac{x}{4} - \sin^2\frac{x}{4}\right) + \frac{11}{4}\cos\frac{x}{4} - 5\sin\frac{x}{4}$

since $t = \tan\frac{x}{8}$

$f'(x) = 5\left(\frac{1-t^2}{1+t^2}\right)^2 - 5\left(\frac{2t}{1+t^2}\right)^2 + \frac{11}{4}\frac{(1-t^2)}{(1+t^2)} - 5\left(\frac{2t}{1+t^2}\right)$

M1, A2

$= \frac{9t^4 - 40t^3 - 120t^2 - 40t + 31}{4(1+t^2)^2}$

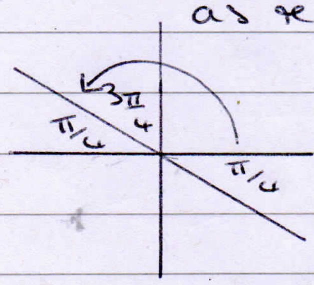
$= \frac{(t+1)(9t^3 - 49t^2 - 71t + 31)}{4(1+t^2)^2}$ A1

as required

b) $f'(x) = 0$

$t + 1 = 0$

$t = -1$



tan −ve.

$\tan\frac{x}{8} = -1$

$\frac{x}{8} = \frac{3\pi}{4}, \frac{7\pi}{4}$. M1

$x = 6\pi, 14\pi$

Smallest $x = 6\pi$ A1

c) From the graph $62 \times k = 300$

$k = 4.83$

answers between $[4.8, 5]$

B1