

BCE and CIE projects (level 000)

Math 1 - Assessed Coursework 1 [counts 10 marks]

Deadline : 1:30 pm Monday 5 Nov. 2012

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Please use A4 paper sheets and write your complete information on the first page

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1) [20 Points] For the function

$$f(x) = \sin(2x)$$

- i) Determine the domain and the range
- ii) Check the symmetry (whether even, odd, or neither)
- iii) Is the function periodic? If so, determine its period
- iv) Graph the function in the interval  $-2\pi \leq x \leq 2\pi$
- v) On the same graph, obtained in (iv), plot the two functions
  - a)  $g(x) = 1 + \sin(2x)$ , [vertical shift]
  - b)  $h(x) = \sin(2x - \pi)$ , [horizontal shift]

2) [20 Points] For the function  $F(x) = 1 + \frac{3}{1-x^2}$

- i) Determine its domain
- ii) Discuss the symmetry (whether even, odd, or neither)
- iii) Find the left and right limits as  $x$  approaches 1 and the limit at infinity
- iv) Find the point(s) of interception with the coordinate axes
- v) Determine the asymptotic lines
- vi) Graph the function

3) [20 Points] For the function  $y = \frac{x-1}{x+1}$ , find

- i)  $y'$  and  $y''$
- ii) equations of the tangent line and normal line at  $(0, -1)$
- iii) the tangent lines that are parallel to the line  $x - 2y - 2 = 0$

4) [20 Points] Determine  $\frac{dy}{dx}$  if

i)  $y = \cos(\sin(x))$

ii)  $y = e^{\sin(\ln x)} + 3^{\sin^{-1}(x)}$

iii)  $\sqrt{y} = (\cos x)^{x/2}$

iv)  $y + x \cos y = x^2 + \log_{10}(\sin x)$

v)  $y = 2 \sin(t) - t^2, \quad t = x^2 + \sinh(x^2)$

5) [20 Points]

i) Find  $f'(x)$  if  $\frac{d}{dx}[f(3x)] = x^2 + 1$

ii) Show that  $\sinh^{-1}(x) = \ln(x + \sqrt{x^2 + 1})$

iii) Prove that  $\frac{d}{dx} \tan^{-1}(\tanh x) = \operatorname{sech}(2x)$

iv) Show that  $\cot^{-1}(\sinh x) = \cos^{-1}(\tanh x)$

Good luck... and Happy Eid

Dr. Samir Shamseldeen