SCHOOL OF ENGINEERING
COLLEGE OF BASIC AND APPLIED SCIENCES
FAEN 201: CALCULUS II
INTERIM ASSESSMENT II

Answer all questions. Time Duration: 1 hour 20 minutes.

1. a. Show that the following limits do not exist
   i) $\lim_{(x,y)\to(0,0)} \frac{2x^2-y^2}{x^2+2y^2}$

   ii) $\lim_{(x,y)\to(0,0)} \frac{3xy}{5x^4+2y^4}$

   b. If $w = (y-2x)^3 - \sqrt{y-2x}$, show that

$$w_{xx} - 4w_{yy} = 0.$$

2. a. If $w = f(x^2+y^2)$, show that

$$y\left(\frac{\partial \omega}{\partial x}\right) - x\left(\frac{\partial \omega}{\partial y}\right) = 0.$$

   (*Hint: Let* $u = x^2+y^2$)
   b. Find the extrema of the function

$$f(x,y) = x^2 - 6x\cos y + 9;\ 0 \le y \le 2\pi$$

   and classify them.

3. a. Find the scalar field, $f(x,y)$ having the gradient

$$\left(\frac{1}{x^2}+\frac{1}{y^2}\right)\mathrm{i} + \left(\frac{1-2x}{y^3}\right)\mathrm{j}.$$

   b. Use Green's theorem to evaluate

$$\int_C \sqrt{1+x^3}dx + 2xydy$$

   where C is the triangle with vertices $(0,0)$,$(1,0)$ and $(1,3)$ oriented counter-clockwise.