Prince Sultan University, Department of Mathematics, 27/01/2011.
Calculus II (Math 113), Final Exam- Fall (101).
Dr Abdul-Wahed HAMDI Duration : 150 min

1. (**6 pts**) Find the sum $S_p = \sum_{k=3}^{p}(1-2k)^2$.

2. (**6 pts**) Find the total area of the region between the x-axis and the graph of $y = 2x - x^2$ over the interval $[-2,\ 2]$.

3. (**6 pts**) Find $F'(2)$ if $F(x) = (x^2-2)\displaystyle\int_2^x [t + 3F'(t)]\ dt$.

4. (**6 pts**) Explain how can we apply Simpson's rule to approximate numerically $\int_a^b f(x)dx$ using n subdivisions.

5. (**8 pts**) Determine y'

$$y = [\sinh(x^2)\ ]^3, \quad y = \left(\sqrt{2x^2+1}\right)^{\sin(x)}$$

6. (**8 pts**) Solve the following differential equation

$$y' + y = \frac{1}{e^x - 1}, \quad y(1) = \frac{1}{e}.$$

7. (**30 pts**) Evaluate the following integrals using the method of your choice

$$\int \frac{1+x}{4x^2+8x+5}\ dx, \quad \int_{-1}^{0}(x-3)\sqrt{1+x}\ dx, \quad \int \sin[\ln(x)]dx.$$

$$\int \frac{2}{x^2-2x+5}dx, \quad \int \frac{x}{\sqrt{1-x^2}}dx, \quad \int \frac{4x^2+13x-9}{x^3+2x^2-3x}\ dx.$$

8. (**10 pts**) Setup the integral giving the volume by the method of your choice (Cylindrical shells or Washers) of the solid generated by revolving the region bounded by $y = 0,\ \ y = \sqrt{x+2},\ \ x = 7$ about

(a) the line $x = +9$, (b) about the line $y = -3$.

9. (**8 pts**) Determine whether the following integrals converge or diverge (justify your answer).

$$\int_{-1}^{0} \frac{dx}{\sqrt[3]{x+1}}, \qquad \int_{\frac{1}{e}}^{e} \frac{dx}{x\ln^2(x)}.$$

10. (**12 pts**) Evaluate each limit

$$\lim_{x\to 1}\frac{x^3-3x+2}{x^2-2x+1}, \quad \lim_{x\to 0^+}\frac{1}{e^x-1} - \frac{1}{x}, \quad \lim_{x\to 0^+}(1+2x)^{\frac{1}{4x}}.$$

Bonus question (5pts) : Evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \sqrt{1+\sin(x)}\ dx, \qquad \int \frac{x^2}{\sqrt{(1-x^2)^3}}dx.$