Prince Sultan University, Department of Mathematics, 20/03/2011.

Calculus II (Math 113) - MidTerm 1-

Dr Abdelouahed HAMDI Duration: 60 min

1. **[5 pts]** Find the sum $S_n = \sum_{k=4}^{n}(2-3k)^2$ in terms of n.

2. **[7 pts]** Use the limit of summation to find the area under the curve of $f(x) = 3x^2 - 2$ over the interval $[1,\ 2]$ using the left-end point of each subinterval.

3. **[12 pts]** Find the following antiderivatives

   - $\int (x-4)\sqrt[3]{2+x}\ dx$
   - $\int [2 - \sin^2(5x)]\ dx$
   - $\int \sin^2(x)\cos^3(x)\ dx$

4. **[6 pts]** Solve the initial-value problem

$$\frac{dy}{dx} = \frac{x^{1.5}(2x^2+1)^3}{\sqrt{x}} + 2x - 1, \quad y(0) = \frac{1}{5}.$$

5. **[20 pts]** Evaluate the following definite integrals

   - $\int_1^2 \frac{4x-2}{4x-1}\ dx$
   - $\int_{-1}^{3} \sqrt{1+|2-x|}\ dx$
   - $\int_{\frac{-1}{\sqrt{2}}}^{\frac{1}{\sqrt{2}}} \sqrt{1-2x^2}\ dx$
   - Let
$$I = \int_0^1 \frac{x^3}{1+x^2}\ dx, \quad J = \int_0^1 \frac{x}{1+x^2}\ dx,$$
     Evaluate J, $I+J$ and J.

   - **Bonus Question [3 pts]**
$$\int_0^{\pi} \sqrt{1-\sin\left(\frac{x}{2}\right)}\ dx.$$