Prince Sultan University, Department of Mathematics,   6/11/10.
Calculus II (Math 113), Mid-Term 1- Fall (101).
DR ABDUL-WAHED HAMDI   DURATION : 90 MIN

– Answer all the questions.
– This exam consists of a total of 3 pages and 9 questions.
– Show your working in the space provided for each question.
– Show all the key steps of your work.
– Scientific, non-programmable calculators are allowed.

Question	Maximum Score	Your Score
1	9	
2	12	
3	4	
4	5	
5	5	
6	6	
7	7	
8	5	
9	7	
Total	60	

Name	
ID Number	

1. Find the following antiderivatives

   (a) $\int x\sqrt{2+x}\ dx$

   (b) $\int \cos^2(3x)\ dx$

   (c) $\int \cot(1-x)\ dx$

2. Evaluate the following definite integrals

   (a) $\int_{-1}^{2} \dfrac{x\ dx}{4+5x^2}$

   (b) $\int_{-1}^{2} \sqrt{2+|x|}\ dx$

   (c) $\int_{0}^{a/b} \sqrt{a^2-b^2x^2}\ dx.$

3. Solve the initial-value problem

$$\frac{dy}{dx} = \sin(x) + 1, \quad y(\pi/3) = \frac{1}{2}.$$

4. Evaluate $\displaystyle\sum_{j=4}^{20} j(1-j)^2$

5. Find the limit by interpreting it as a limit of a Riemann sum in which the interval $[0,\ 1]$ is divided into n subintervals of equal length

$$\lim_{n\to\infty} \frac{1^4 + 2^4 + 3^4 + \cdots + n^4}{n^5}.$$

6. Use the limit of summation to find the area under the curve of $f(x) = 2 + 4x$ over the interval $[0,\ 3]$. Use x_k^* as the midpoint of each subinterval.

7. Find the total area of the region between the x-axis and the graph of $y = x^2 - 3x$ over the interval $[-1, \ 4]$.

8. A particle moves with a velocity $v(t) = 0.5 - \frac{1}{t^2}$ m/s along an s-axis. Find the displacement and the distance traveled by the particle during the time interval $[1, \ 3]$.

9. Find
   (a) the value(s) of x^* that satisfies the Mean-Value Theorem for the function $\phi(x) = 2x - x^2$ over the interval $[0, \ 2]$,

   (b) the average value of ϕ on $[0, \ 2]$,

   (c) $F'(x)$ and its domain where $F(x) = \int_4^x \frac{1}{\sqrt{t}}$.

10. **Bonus question** Show that $\int_0^{\pi/2} \sin^n(x) \ dx \ = \ \int_0^{\pi/2} \cos^n(x) \ dx$.