King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
**Math 201-19 Class Test 1 Fall 2010(010)**

ID#:_____ NAME:_____

Serial#_____ **(SHOW YOUR WORK)**

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(1) Set up, **but do not evaluate**, an integral that represents the area of the inner loop of the Limacon $r = 1 + 2\sin\theta$. (10pts)

(2) Determine the area that is inside both $r = 3+2\sin\theta$ and $r = 2$. (15pts)

(3) Sketch and identify the curve (10pts)

$$x = 3\cos(2t),\ y = 1 + \cos^2(2t)$$

by eliminating the parameter $t$, and label the direction of increasing $t$.

(4) Find all points on the curve $x = t^3 - 3t$, $y = 3t^2 - 9$, where the tangent is (i) horizontal, (ii) vertical. (8pts)

(5) Find the tangent line(s) to the parametric curve given by $x = t^5 - 4t^3$, $y = t^2$ at $(0, 4)$. (10pts)

(6) Determine the length of $r = \theta$, $0 \leq \theta \leq 1$.
(Hint: $\int \sec^3 x dx = \sec x \tan x + \ln|\sec x + \tan x| + C$) (10pts)

(7) Determine the surface area of the solid obtained by rotating the parametric curve

$$x = \cos^3(\theta),\ y = \sin^3(\theta),\ 0 \leq \theta \leq \tfrac{\pi}{2}$$

about the $x$-axis. (7pts)

(8) Sketch $r = 2\cos\frac{\theta}{2}$, $0 \leq \theta \leq 2\pi$. (10pts)

(9) Determine the equation of the tangent line to (10pts)

$$r = 2 + 2\cos 2\theta \text{ at } \theta = \tfrac{\pi}{4}.$$

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(10) Find the Cartesian equation of the curve whose polar equation is given as: (10pts)

$$r = \sin^2 \frac{\theta}{2} + \tan \theta$$

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