Review Exercises for Supplementary Examination
Subject: Mathematics for Engineering 3
Semester 1, Academic year 2013-2014
Lecturer: Mr. MONG Mara
July 18, 2014

1) If $z=\ln\sqrt{x^2+y^2}$ show that $x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=1$

2) If $z=\frac{y}{x+y}$, evaluate $x\frac{\partial z}{\partial x}+y\frac{\partial z}{y}$

3) If $f(x,y)=\tan^{-1}\frac{y}{x}$ show that $f_{xx}+f_{yy}=0$

4) Evaluate $\iint_R \frac{1}{1+x^2+y^2}dA$ where R is the sector in the first quadrant that is bounded by $y=0, y=x$ and $x^2+y^2=4$.

5) Evaluate $\int_0^2\int_0^{\sqrt{2x-x^2}}\sqrt{x^2+y^2}\,dydx$.

6) Sketch the region $R=\{(x,y)\in\mathbb{R}^2 : 1\le x\le 2, 0\le y\le 1\}$ and evaluate the double integral $\iint_R (x^2+y^2)\,dA$.

7) Sketch the region R which is bounded by the lines $y=1, y=2, x=0$ and $x=y$ then evaluate the double integral $\iint_R x\sqrt{y^2-x^2}\,dxdy$.

8) Sketch the region R in the first quadrant which is bounded by the parabola $y=x^2$ the line $y=0$ and $x=1$ then evaluate the double integral $\iint_R xe^y dA$.

9) A lamina with density $\delta(x,y)=x+y$ is bounded by the x-axis, the line $x=1$ and the curve $y=\sqrt{x}$. Find its mass and its moment about y-axis.

10) A triangular lamina is bounded by $y=x$, $x=1$ and x-axis. Its density is $\delta=1$. Find it moment about y-axis.

11) A lamina with density $\delta(x,y)=x+y$ is bounded by the x-axis, the line $x=1$ and the curve $y=\sqrt{x}$. Find its mass and its moment about x-axis.

12) Find the volume of the solid that is bounded above by the plane $z=x+2y+2$ below by the xy-plane and laterally by $y=0$ and $y=1-x^2$.

13) Find the volume bounded by the cylinder $x^2+y^2=4$ and the planes $y+z=4$ and $z=0$.

14) Find the volume in the first octant bounded by the three coordinate planes and the planes $x+2y=4$ and $x+8y-4z=0$.

15) Use double integral to find the volume of the wedge cut from the cylinder $4x^2+y^2=9$ by the plane $z=0$ and $z=y+3$.

16) Let G be the tetrahedron in the first octant bounded by the coordinate planes and the planes $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1, (a>0, b>0, c>0)$.
   a) List six different iterated integrals that represent the volume of G.
   b) Evaluate any one of the six to show that the volume of G.

17) Solve the equations
   a) $y''-4y'+4y=e^x$
   b) $y''+y=\sin 2x$
   c) $y''+4y'=\sin 2x$