

Day 5

1. Which of the equations below are homogenous? State the degree for any that are homogenous.
  - a.  $x^{1/2}y^{1/2}$
  - b.  $x^2y+xy^2-xy+4$
  - c.  $y\ln x + e^{xy}$
  - d.  $x^2 + y^2$
  - e.  $\frac{xy}{x^2+y^2}$
  
2. Use implicit differentiation to find  $dy/dx$  for the following equations.
  - a.  $x^3 + y^3 = 5$
  - b.  $y = x^2y^3 + x^3y^2$
  - c.  $\ln y = yx + x$
  
3. Determine if each of the following is convex, concave, quasiconcave, or quasiconvex at (2,3) and at (e, 0).
  - a.  $f(x,y)=x^2+y^2+(xy)^2$
  - b.  $f(x,y)=x^3y+xy^3$
  - c.  $\ln x + e^y$
  
4. If  $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$  and  $x = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$  calculate
  - a.  $\frac{\partial Ax}{\partial x}$  by writing out  $Ax$
  - b.  $\frac{\partial x'Ax}{\partial x}$  by writing out the full expression
  - c.  $\frac{\partial |A|}{\partial a_{21}}$  where  $A = \begin{bmatrix} 2 & 1 & 1 \\ a_{21} & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$
  
5. Evaluate the following
  - 1)  $\int (3x - 1)^2 dx$
  - 2)  $\int x(2x + 3) dx$
  - 3)  $\int_0^5 a^2 dx$
  - 4)  $\int_1^2 \frac{x}{(x^2+5)^3} dx$
  - 5)  $\int \frac{(1+x^{1/2})^3}{x^{1/2}} dx$
  - 6)  $\int_5^5 \frac{x^{17} \ln x}{e^x} dx$
  - 7)  $\int_0^2 (x^4 - 2x^3) dx$