2.5 Special Integrating Factors

Name: Date: May 28, 2013

P 7. Solve

$$(2xy)\,dx + (y^2 - 3x^2)\,dy = 0$$

P 9. Solve

$$(x^4 - x + y)\,dx - x\,dy = 0$$

P 10. Solve

$$(2y^2 + 2y + 4x^2)\, dx + (2xy + x)\, dy = 0$$

P 11. Solve

$$(y^2 + 2xy)\, dx - x^2\, dy = 0$$

P 13. Solve

$$(2y^2 - 6xy)\,dx + (3xy - 4x^2)\,dy = 0$$

P 14. Solve

$$(12 + 5xy)\,dx + (6xy^{-1} + 3x^2)\,dy = 0$$

P 15.

(a) Show that if $(\partial N/\partial x - \partial M/\partial y)/(xM - yN)$ depends only on the product xy, that is

$$\frac{\partial N/\partial x - \partial M/\partial y}{xM - yN} = H(xy),$$

then the equation $M(x, y)\, dx + N(x, y)\, dy = 0$ has an integrating factor of the form $\mu(xy)$. Give the general formula for $\mu(xy)$.

(b) USe your answer to part (a) to find an implicit solution to

$$(3y + 2xy^2)\, dx + (x + 2x^2y)\, dy = 0,$$

satisfying the initial condition $y(1) = 1$.

P 17.

(a) Find a condition on M and N that is necessary and sufficient for $M\,dx + N\,dy = 0$ to have an integrating factor that depends only on the product x^2y.

(b) Use part (a) to solve the equation

$$(2x + 2y + 2x^3y + 4x^2y^2)\,dx + (2x + x^4 + 2x^3y)\,dy = 0.$$

P 18. If $xM(x,y)+yN(x,y)=0$, find the solution to the equation $M(x,y)\,dx+N(x,y)\,dy=0$.