Math 1411 **Worksheet 10**

Identify the following differential equations as (a) separable, (b) exact, or (c) first-order linear. Then find their solution.

1. $(x^2+4)\frac{dy}{dx} = xy$
2. $x^2(1+2y^2) + 3x^3yy' = 0$
3. $y' + 3x^2y = 6x^2$
4. $x^2y' + xy = 1$ for $x > 0$ and $y(1) = 2$
5. $4x + 3y + 3(x + y^2)y' = 0$
6. $2x + y^2 + xyy' = 0$ (you may need an integrating factor $I(x) = x$)
7. $3x^2 + 2xy + 3y^2 + (x^2 + 6xy)y' = 0$ where $y = 2$ when $x = 1$.
8. $3x^2 - 2x + 3y + (3x - 2y)y' = 0$
9. $xydx + e^{-x^2(y^2-1)}dy = 0$
10. $\sin(y)dx + (1 + x\cos(y)dy = 0$
11. $y' + 2xy = 1$
12. $(x+y)e^{x/y} + (x - \frac{x^2}{y})e^{x/y}y' = 0$

Sketch and identify the curve defined by the parametric equations $x(t) = t^2 - 2t$ and $y(t) = t + 1$.

What curve is represented by the parametric equations $(sin(t), cos(t))$, $0 \le t \le 2\pi$. How about the curve represented by $(sin(2t), cos(2t))$, same t restrictions.

Find a parametric equation of a line through the points $(1, 3)$ and $(-2, -1)$.

Find the parametric equation of a circle with center $(-1, 2)$ and radius $r = 2$.

Find the slope to the regular cycloid $x = r(t - sin(t))$, $y = r(1 - cos(t))$.

A curve C is defined by the parametric equations $x = t^2$ and $y = t^3 - 3t$. Find points where the tangent line is horizontal or vertical.

Find the arc length of the curve represented by (t^3, t^2) as $t \in [0, 4]$

Find the surface area of the curve represented by $x = t^2 + 2/t$ and $y = 8\sqrt{(t)}$ as $t \in [1, 9]$.