Math 2415 **Homework Set 8** **10 Points**

Vector Fields

For problems 1 and 2 find the gradient vector field for the given function.

1. $f(x,y) = x^2 \ln\left(\frac{y^3}{x^2}\right)$

2. $f(x,y,z) = \frac{4x-3z}{y+2z}$

Parametric Curves

For problems 3 – 6 write down a set of parametric equations for the given curve as well as a range of the parameter *t* for which the curve will be traced out exactly once. Make sure that your parametric equations also trace out the curve in the indicated direction, if a direction is given.

3. $4x^2 + \frac{y^2}{100} = 1$

4. $y = x^3 - \mathbf{e}^{-6x}, \; -3 \le x \le 0$

5. The line segment that starts at (4,-1) and ends at (1, 23).

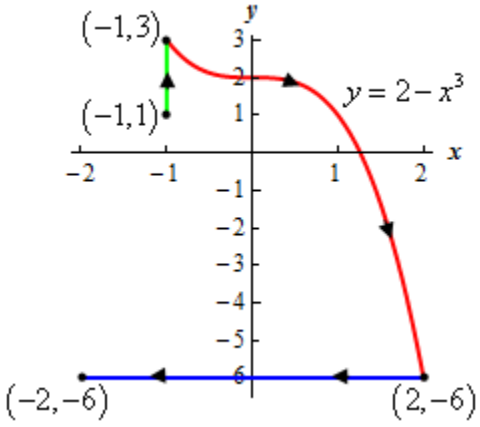
6. The line $x = -3$ that starts at $y = 13$ and ends at $y = -2$.

Line Integrals, Part I

7. Evaluate $\int_C 12x^3 \, ds$ over each of the following curves.

(a) *C* is the line segment from (-1, 1) to (-2,-6).

(b) *C* is the curve shown below and for this problem you MUST follow the given orientation.



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8. Evaluate $\int_C 4x+7y\,ds$ where *C* is the portion of $x^2+y^2=4$ that is in the 2nd quadrant with clockwise orientation.

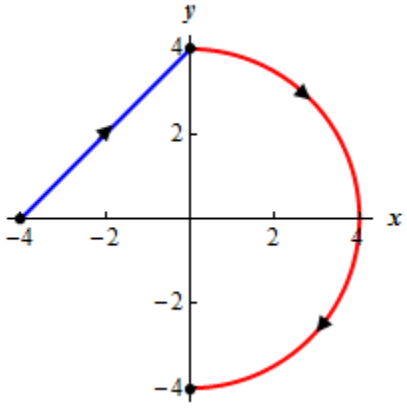
9. Evaluate $\int_C \frac{(x-1)^3 y^2}{z}\,ds$ where *C* is the curve given by $\vec{r}(t)=\langle 1-t, 2t, 3t\rangle$, $1\le t\le 4$

Line Integrals, Part II

For problems 10 – 12 evaluate the line integral on he given curve.

10. $\int_C \cos(4y)\,dy$ where *C* is the curve given by $y=\mathbf{e}^{2x}$, $0\le x\le \ln(2)$.

11. $\int_C x^3 dx-(x^2-1)\,dy$ where *C* is the line segment from (-4, 0) to (0, 4) followed by the right portion of the circle of radius 4 centered at the origin as shown below.



12. $\int_C y^3\,dx-(2-4z)\,dy+2xz\,dz$ where *C* is the line segment from (2, -3, 0) to (-1, 1, 2).