Math 2415
Homework on 16.2

1. Evaluate $\int_C f\,ds$ where C has parametrization $\mathbf{r}$ with

   (a) $\mathbf{r}(t) = (5\sin t, 12t, 5\cos t)$ for $0 \le t \le 4\pi$ and $f(x,y,z) = y + z$.

   (b) $\mathbf{r}(t) = (t, t^2, 1)$ for $0 \le t \le 2$ and $f(x,y,z) = x$.

2. Evaluate $\int_C \sqrt{x+y}\,ds$ where C is the concatenation of two curves C_1 and C_2, with C_1 being the line segment from $(0,0)$ to $(1,0)$ and C_2 is the line segment from $(1,0)$ to $(1,2)$.

3. Find the mass of the wire that is modeled by the quarter circle, $x^2 + y^2 = 1$ with $x \ge 0$ and $y \ge 0$, and whose density is $f(x,y) = x + y$.

4. Suppose that a vertical wall has a base in the shape of the parabola $x = y^2$ for $0 \le y \le 4$ and height given by $z = f(x,y) = y + \sqrt{x}$. Calculate the area of the wall.

5. Evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$ where C has parametrization $\mathbf{r}$ with $\mathbf{r}(t) = (\cos t, \sin t, 2t)$ for $0 \le t \le \pi$ and $\mathbf{F}(x,y,z) = y\mathbf{i} - x\mathbf{j} + z\mathbf{k}$.

6. Calculate $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $\mathbf{F} = x\cos(y)\mathbf{i} + xyz\mathbf{k}$ and C is parametrized by $\mathbf{r}(t) = t\mathbf{i} + t^2\mathbf{j} + t^3\mathbf{k}$, for $0 \le t \le 2$.

7. Compute the work done by the force $\mathbf{F} = x\mathbf{i} + y\mathbf{j}$ on a particle whose position at time t is given by $\mathbf{r}(t) = (1 + \sin t)\mathbf{i} + (1 + \sin^2 t)\mathbf{j}$ for $0 \le t \le \frac{\pi}{2}$.

8. Evaluate $\int_C yz\,dy + xy\,dz$ where C is the curve given by $x = \sqrt{t}$, $y = t$, $z = t^2$ for $1 \le t \le 2$.