This is just answers. Solutions will be distributed in class.

1. Evaluate the line integral by two methods: directly and using Green's Th
(a) $\int_{C} y d x-x d y$, where $C$ is a circle of radius $R$.

Answer: $-2 \pi R^{2}$.
(b) $\int_{C} x y d x+x^{2} y^{3} d y$, where $C$ is a triangle with vertices $(0,0),(1,0)$, and $(1,2)$. Answer: 2/3.
2. Use Green's Th to evaluate the line integral along the given positively oriented curve.
(a) $\int_{C}\left(y+e^{\sqrt{x}}\right) d x+\left(2 x+\cos y^{2}\right) d y$, where $C$ is the boundary of the region enclosed by the parabolas $y=x^{2}$ and $x=y^{2}$.
Answer: $1 / 3$
(b) $\int_{C} x e^{-2 x} d x+\left(x^{4}+2 x^{2} y^{2}\right) d y$, where $C$ is the boundary of the region between two circles $x^{2}+y^{2}=1$ and $x^{2}+y^{2}=4$.
Answer: 0
(c) $\int_{C} y^{2} \cos x d x+\left(x^{2}+2 y \sin x\right) d y$, where $C$ is the triangle from $(0,0)$ to $(2,6)$ to $(2,0)$ to $(0,0)$. Answer: - 16
3. Find the work done by force field $\vec{F}=\left(x ; x^{3}+3 x y^{2}\right)$ moving an object from $(-2,0)$ to $(2,0)$ along x -axis and then along the semicircle $y=\left(4-x^{2}\right)^{1 / 2}$ to the starting point. (Use Green's Th) Answer: $12 \pi$
4. Find parametric representation for the surface.
(a) The lower part of the ellipsoid $2 x^{2}+4 y^{2}+z^{2}=1$

Answer: $\vec{r}(u, v)=\left(u, v,-\sqrt{1-2 u^{2}-4 v^{2}}\right)$, where $2 u^{2}+4 v^{2} \leq 1$
(b) The part of the sphere $x^{2}+y^{2}+z^{2}=4$ that lies above the cone $z=\left(x^{2}+y^{2}\right)^{1 / 2}$. Answer: $\vec{r}(u, v)=\left(u, v, \sqrt{4-u^{2}-v^{2}}\right)$, where $u^{2}+v^{2} \leq 2$
(c) The part of the the cone $z^{2}=x^{2}+y^{2}$ that lies inside the sphere $x^{2}+y^{2}+z^{2}=4$. Answer: $\vec{r}(u, v)=(u \cos v, u \sin v, u),|u| \leq \sqrt{2}, 0 \leq v \leq 2 \pi$
(d) The part of the cylinder $x^{2}+y^{2}=16$ that lies between $z=2$ and $z=-2$. Answer: $\vec{r}(u, v)=(4 \cos v, 4 \sin v, u),|u| \leq 2,0 \leq v \leq 2 \pi$
5. Find the area of the surface.
(a) The part of the surface $y=4 x+z^{2}$ that lies between planes $x=0, x=1, z=0, z=1$. Answer $\int_{0}^{1} \int_{0}^{1} \sqrt{17+4 z^{2}} d x d z=\frac{\sqrt{21}}{2}+\frac{17}{4}(\ln (2+\sqrt{21})-\ln \sqrt{17})$
(b) The helicoid $\vec{r}(u, v)=(u \cos v, u \sin v, v), 0 \leq u \leq 1,0 \leq v \leq \pi$.

Answer $\int_{0}^{\pi} \int_{0}^{1} \sqrt{1+u^{2}} d u d v=\frac{\pi}{2}(\sqrt{2}+\ln (1+\sqrt{2}))$

