Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Take–home Quiz 2**

1. Consider the function $f\left(x,y\right)=3x^{2}y-4xy^{2}+\left(2x+3y\right)^{2}$
2. Find $f\_{x}$
3. Find $\frac{∂^{2}f}{∂y^{2}}$
4. Find $∇f$
5. If $f\left(x,y\right)=3x^{2}y^{3}-2xy$ and $x=cos⁡(t)$ and $y=sin⁡(t)$, then find $\frac{∂f}{∂t}$ for $t=0$
6. Suppose $f\left(x,y\right)=x^{2}+y^{2}+xy$
7. Find the directional derivative $D\_{v}\left(f\right)$ at $P\left(1,1\right)$ in the direction $v=<3,4>$
8. If you are standing a $P\left(1,1\right)$, in which direction would the function increase the most?
9. What is the steepest increase of $f(x,y)$ at $P(1,1)$?
10. Find all local max, min, and saddle points, if any, for $f\left(x,y\right)=x^{2}+4y^{2}+8xy+18x$