MT 1800 CALCULUS I
SUMMARY OF PROPERTIES OF DERIVATIVES AND GRAPHS

Definitions:

- A point $(t, f(t))$ on the graph of $f(t)$ at which $f'(t) = 0$ is called a **critical point**.
- $f(t)$ has a **local maximum** at $t = a$ if $f(a) \geq f(t)$ for all *t* close to *a*.
- $f(t)$ has a **local minimum** at $t = a$ if $f(a) \leq f(t)$ for all *t* close to *a*.
- $f(t)$ has a **global maximum** at $t = a$ if $f(a) \geq f(t)$ for all *t* in the domain of *f*.
- $f(t)$ has a **global minimum** at $t = a$ if $f(a) \leq f(t)$ for all *t* in the domain of *f*.
- A point on the graph of a function *f(t)* at which a change of concavity occurs is called an **inflection point**.

Property of *f(t)*	**Test Condition**
f(t) is increasing on *(a, b)*	$f'(t) > 0$ for all *t* in *(a,b)*
f(t) is decreasing on *(a, b)*	$f'(t) < 0$ for all *t* in *(a,b)*
f(t) has a local maximum at *t = a*	**First Derivative Test:** $f'(a) = 0$ and $f'(t) > 0$ before *a* and $f'(t) < 0$ after *a*
f(t) has a local maximum at *t = a*	**Second Derivative Test:** $f'(a) = 0$ and $f''(a) < 0$
f(t) has a local minimum at *t = a*	**First Derivative Test:** $f'(a) = 0$ and $f'(t) < 0$ before *a* and $f'(t) > 0$ after *a*
f(t) has a local minimum at *t = a*	**Second Derivative Test:** $f'(a) = 0$ and $f''(a) > 0$
f(t) is concave upward on *(a, b)*	$f''(t) > 0$ for all *t* in *(a, b)*
f(t) is concave downward on *(a, b)*	$f''(t) < 0$ for all *t* in *(a, b)*
f(t) has an inflection point at *t = a*	$f''(t) = 0$ and $f''(t)$ changes sign as *t* passes through *a*