FILL IN THE BLANK NAME Key

1. If $f(x)$ is increasing, then $f'(x)$ is positive.

2. $f'(x)$ is negative if $f(x)$ is decreasing.

3. $f''(x)$ is positive if $f(x)$ is concave up.

4. $f''(x)$ is negative if $f'(x)$ is decreasing.

5. If $f(x)$ is concave down, then $f'(x)$ is decreasing.

6. If $f'(x)$ is increasing, then $f''(x)$ is positive.

7. If $f'(x)$ is decreasing, then $f(x)$ is concave down.

8. If $f'(x) > 0$ and $f''(x) < 0$, then $f(x)$ looks like ____________________.

9. If $f(x)$ is an exponential decay curve, then $f'(x)$ is negative and increasing. (over)

10. If $f(x)$ has an inflection point, then $f(x)$ has a change in concavity.

11. If $f(x)$ has a horizontal tangent, then $f'(x)$ has a zero.

12. If $f'(a) = 0$, then $f(x)$ has a Horizontal tangent at $x = a$.

13. If $f'(x)$ has a change of sign and is always defined, then $f(x)$ has either a maximum or minimum. (over)

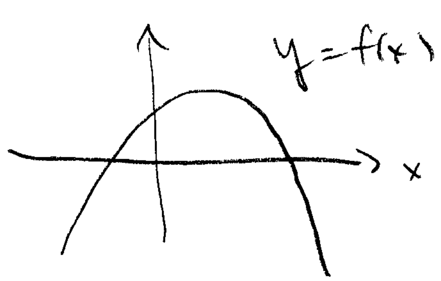
14. If $f(x)$ has a corner at $x = a$, then $f'(a)$ is undefined ← $\boxed{\text{more later}}$

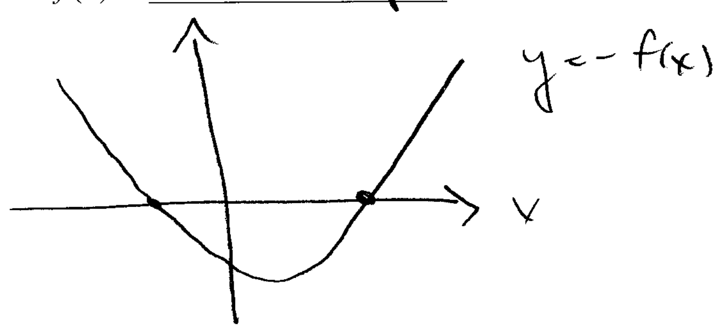
15. If $f'(x) = 0$ for all values of x, then $f(x)$ is constant.

16. If $f''(x) = 0$ for all values of x, then $f(x)$ is a line (it has constant slope!)

17. If $f'(a) = 2$ and $g(x) = f(x) - 5$, then $g'(a) =$ $f'(a) = 2$. (over)

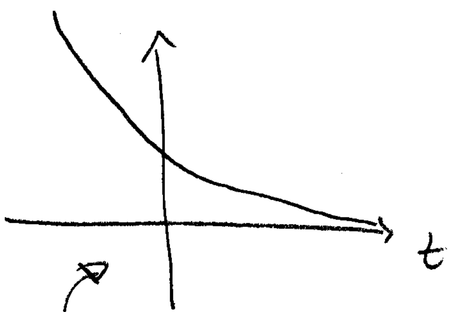
18. If $f(x)$ is concave down everywhere, then $-f(x)$ is concave up. (see below)





#9

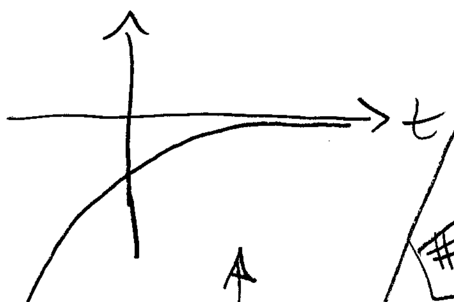
An exponential decay curve looks like this:



$f(t) = P_0 e^{-kt}$

It is clear from the graph that f is decreasing (i.e. f' is negative). It is also clear that the slope for $t < 0$ is a large negative number. As $t \to \infty$ this negative number approaches zero. Hence f' is increasing

Sketch of derivative



$y = f'(t)$

#17

$$g'(a) = \lim_{h \to 0} \frac{g(a+h) - g(a)}{h}$$

$$= \lim_{h \to 0} \frac{f(a+h) - 5 - (f(a) - 5)}{h}$$

$$= \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

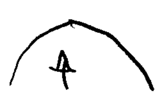
$$= f'(a)$$

$$= 2$$

#13

If f' changes sign, then either

i) f goes from increasing to decreasing



maximum

or

ii) f goes from decreasing to increasing

minimum