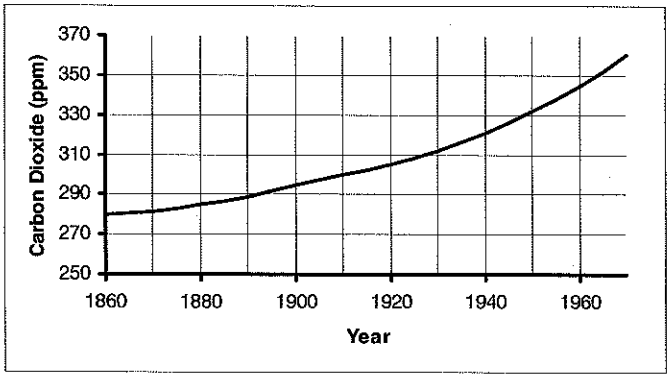
1. Estimate $P'(1940)$ and give a practical interpretation. P represents the amount of carbon dioxide (ppm) in the atmosphere, t represents the year.



2. The speed of a car in mph can be expressed in terms of the length of a skid mark in feet when brakes are applied. Estimate $S'(20)$ and give a practical interpretation if $S(L) = 2\sqrt{5L}$.

3. Suppose a filter has been designed to remove 100 grams of sediment from a storage tank. Let $Q(t)$ be the amount of sediment in the tank at time t.

A. Estimate $Q'(3)$ if the filter removes a fixed amount of sediment each hour, say 2.3 grams.

B. Estimate $Q'(3)$ if the filter removes a fixed percentage of sediment each hour, say 20 %.

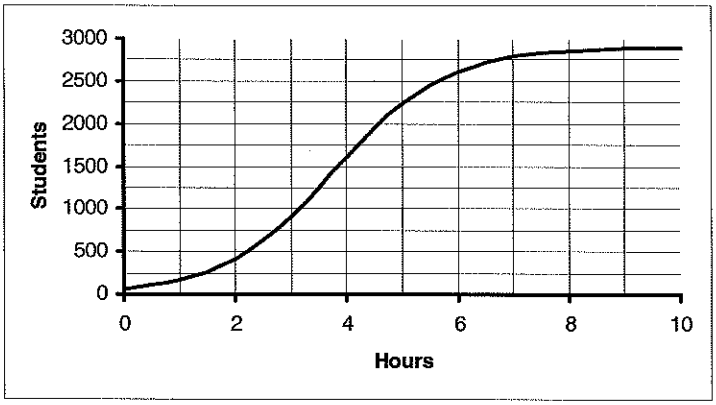
C. Give a practical interpretation of one of your answers above.

→

4. Estimate $L'(35)$ and give a practical interpretation. L is the light output (millions of lumens) and t is the time after ignition (milliseconds) of a No. 22 lightbulb.

Time after ignition	0	5	10	15	20	25	30	35	40	45	50
Light output	0	0.2	0.5	2.6	4.2	3.0	1.7	0.7	0.35	0.2	0

5. The registrar has put a counter on the RSVP registration telephone lines to count the total number of students registering during the day. A graph of $N(t)$, the total number of students who have registered during the t hours since noon, is given below.



A. Estimate $N^{-1}(2000)$ and give an interpretation.

B. Estimate $N'(2)$ and give an interpretation.

C. Estimate coordinates of the inflection point. Explain the significance of this point in terms of the problem.

D. Sketch a graph of $N'(t)$.

COMPLETE EACH BLANK WITH THE BEST ANSWER.

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

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

3. $f''(x)$ is positive if $f(x)$ is _____.

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

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

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

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

8. If $f'(x) > 0$ and $f''(x) < 0$, then $f(x)$ looks like _____[DRAW A SKETCH].

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

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

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

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

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

14. If $f(x)$ has a corner at $x = a$, then $f'(a)$ is _____.

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

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

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

18. If $f(x)$ is concave down everywhere, then $-f(x)$ is _____.

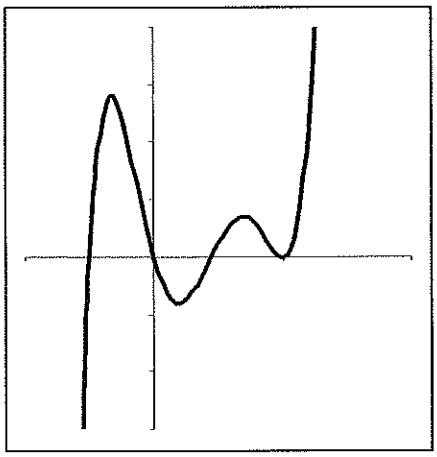
19. If the slope of $f(x)$ increases, then $f(x)$ is _____.

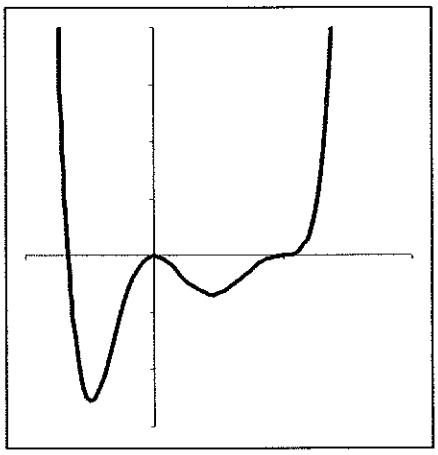
20. If $f''(x)$ has an x-intercept, then $f'(x)$ has a _____.

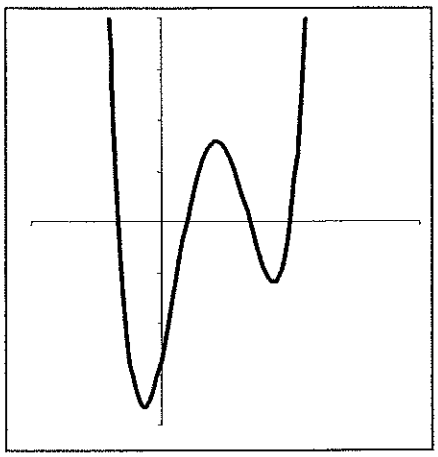
21. If $f(x)$ has a vertical tangent at $x = a$, then $f'(a)$ is _____.

IN EACH **COLUMN** OF GRAPHS YOU WILL NEED TO DETERMINE WHICH IS $f(x)$, $f'(x)$ AND $f''(x)$. INCLUDE YOUR REASONING

22.







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