ANS KEY

Name _____

Date _____

4

## Sample Questions

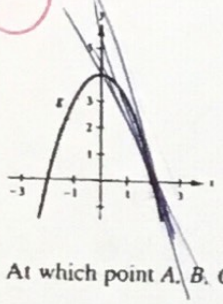
*Show all your work on a separate sheet of paper. Indicate clearly the methods you use because you will be graded on the correctness of your methods as well as on the accuracy of your answers.*

### Multiple Choice

1. Given the graph of $y = g(x)$, estimate the value of $g'(2)$.

slope at 2

(a) $-4$ (b) $-1$ (c) 0 (d) 1 (e) 4



draw tangent line

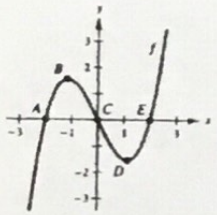
count

2. At which point $A$, $B$, $C$, $D$, or $E$ on the graph of $y = f(x)$ are both $y'$ and $y''$ positive?

slope pos

concave U

(a) $A$ (b) $B$ (c) $C$ (d) $D$ (e) $E$



3. Given the graph of $h'(x)$, which of the following statements are true about the graph of $h$?

slope of the slope $f'(1) = 0$ at $1 = 0$

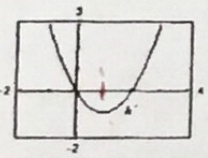
I. The graph of $h$ has a point of inflection at $x = 1$. — slope is changing from − to +

II. The graph of $h$ has a relative extremum at $x = 0$. — $f'$ changes from pos to neg - Rel max

III. The graph of $h$ has a relative extremum at $x = 1$. — $f'$ must change from neg to

(a) I only (b) II only (c) III only (d) I and II only (e) I and III only

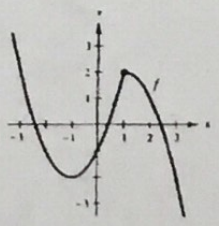
$h'(x)$



at 1 the slope is neg

### Free Response

The graph of the function $f$ is shown in the figure.



(a) Estimate $f'(0)$. = 2

(b) On what open intervals is $f$ increasing? $-1, 1$

(c) On what open intervals is $f$ concave downwards? $1, 3$

(d) What are the critical numbers of $f$? $-1, 1$

(e) Sketch the graph of $f'$.

## Exercises and Problems for Section 2.6

### Exercises

1. For the function graphed in Figure 2.52, are the following quantities positive or negative?

   (a) $f(2)$ (b) $f'(2)$ (c) $f''(2)$

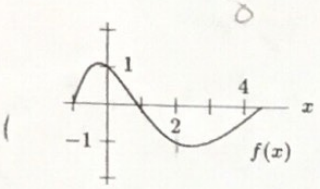
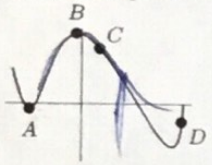



Figure 2.52

2. The graph of a function $f(x)$ is shown in Figure 2.53. On a copy of the table indicate whether $f$, $f'$, $f''$ at each marked point is positive, negative, or zero.




| Point | $f$ | $f'$ | $f''$ |
|---|---|---|---|
| $A$ | | | |
| $B$ | | | |
| $C$ | | | |
| $D$ | | | |

Figure 2.53

3. At which of the labeled points on the graph in Figure 2.54 are both $dy/dx$ and $d^2y/dx^2$ positive?

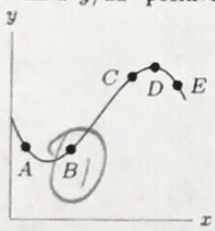



Figure 2.54

4. The distance of a car from its initial position $t$ minutes after setting out is given by $s(t) = 5t^2 + 3$ kilometers. What are the car's velocity and acceleration at time $t$? Give units.

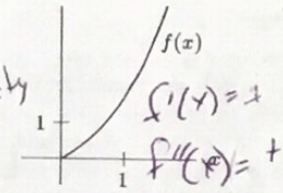
5. Sketch the graph of a function whose first and second derivatives are everywhere positive.

6. Sketch the graph of a function whose first derivative is everywhere negative and whose second derivative is positive for some $x$-values and negative for other $x$-values.

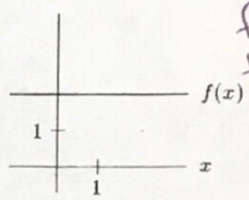
7. Sketch the graph of the height of a particle against time if velocity is positive and acceleration is negative.

For Exercises 8–13, give the signs of the first and second derivatives for each of the following functions.

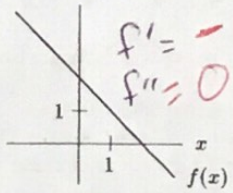
8.



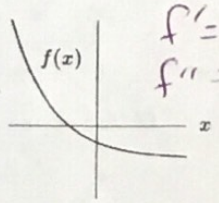

9.



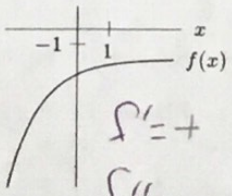

10.



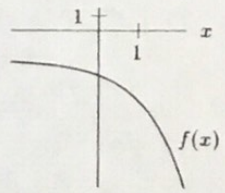

11.




12.




13.




### Problems

14. The table gives the number of passenger cars, $C = f(t)$, in millions, in the US in the year $t$.

   (a) Do $f'(t)$ and $f''(t)$ appear to be positive or negative during the period 1940–1980?

   (b) Estimate $f'(1975)$. Using units, interpret your answer in terms of passenger cars.

| $t$ (year) | 1940 | 1950 | 1960 | 1970 | 1980 |
|---|---|---|---|---|---|
| $C$ (cars, in millions) | 27.5 | 40.3 | 61.7 | 89.3 | 121.6 |

15. An accelerating sports car goes from 0 mph to 60 mph in five seconds. Its velocity is given in the following table, converted from miles per hour to feet per second, so that all time measurements are in seconds. (Note: 1 mph is 22/15 ft/sec.) Find the average acceleration of the car over each of the first two seconds.

| Time, $t$ (sec) | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Velocity, $v(t)$ (ft/sec) | 0 | 30 | 52 | 68 | 80 | 88 |