Week in Review # 5
Sections 2.2, 2.3, 2.4

Things to know:
• Be able to sketch the graph of a derivative.
• Be able to give units for the derivative and interpret a derivative.
• Be able to use the derivative to estimate values of a function.
• Know the relationships between the function, first derivative, and the second derivative.
• Be able to sketch a graph of a function given information about its first and second derivatives.

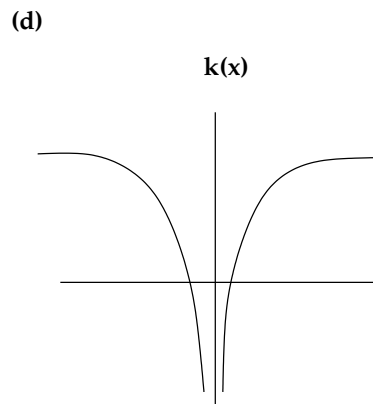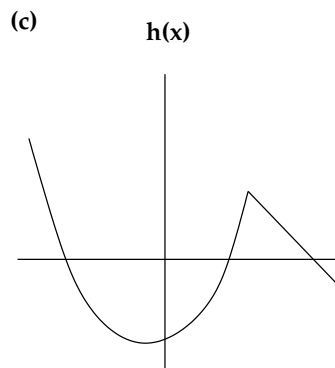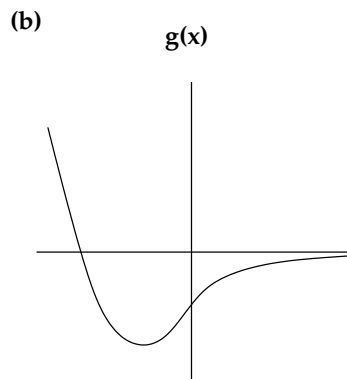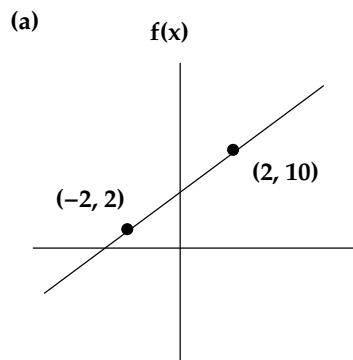1. Fill in the blanks with the relationships between $f(x)$, $f'(x)$, and $f''(x)$.

   $f'(x) > 0$ means that _____

   $f'(x) < 0$ means that _____

   $f''(x) > 0$ means that _____ and _____

   $f''(x) < 0$ means that _____ and _____

2. Sketch the graphs of the derivatives of each of these functions.

   (a)   f(x)

   (−2, 2)   (2, 10)

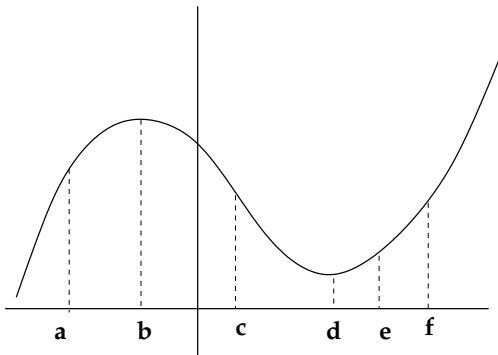   **(b)**   g(x)

   (c)   h(x)

   (d)   k(x)

3. Here is the graph of the function $f(x)$.

   (a) Arrange the derivatives at the given points from smallest to largest.
   (b) At which points does $f'(x)$ and $f''(x)$ have the same sign?
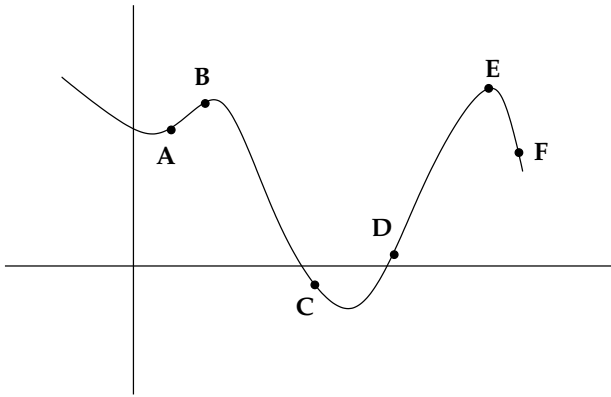
4. Match the points with the derivatives.

x						
$f'(x)$	0	1	0	-2	2	2
$f''(x)$	2	3	-2	0	-4	4

5. Suppose $H = f(t)$ is the time, in minutes, that it takes a deep fryer to heat up to t^0F.

   (a) What are the units of $f'(t)$ and what is the sign of $f'(t)$?
   (b) What is the meaning of $f(350) = 15$?
   (c) what is the meaning of $f'(350) = 0.25$?
   (d) Estimate the time for the deep fryer to heat up to 375^oF.

6. Suppose $P(t)$ is the monthly payment, in dollars, on a mortgage which will take t years to pay off.

   (a) What are the units of $P'(t)$ and the sign of $P'(t)$?
   (b) What is the practical meaning of $P'(t)$?

7. Suppose $g(20) = 125$ and $g'(20) = -8$. Estimate $g(18)$, $g(25)$, and $g(31)$.

8. If $f(3) = 20$, $f'(3) = 2$ and $f''(x) < 0$ for $x \geq 3$, what can you say about the value of $f(7)$?

9. The temperature inside a house was given by $f(t)$ in °F. At 1pm, the temperature was 70°F. The first derivative, $f'(t)$ decreased until reaching a value of 1°F/hour at 1pm, then increased for the rest of the day. sketch a graph of the temperature inside the house during this time period.

10. Sketch a graph of a function that meets these conditions.
    $f(x)$ is positive for $x < 0$
    $f'(x) > 0$ for $x < 3$
    $f'(x) < 0$ for $x > 3$
    $f''(x) < 0$ for $x > 0$
    $f''(x) > 0$ for $x < 0$
    $f'(3) = 0$

11. Here is the graph of $f'(x)$.
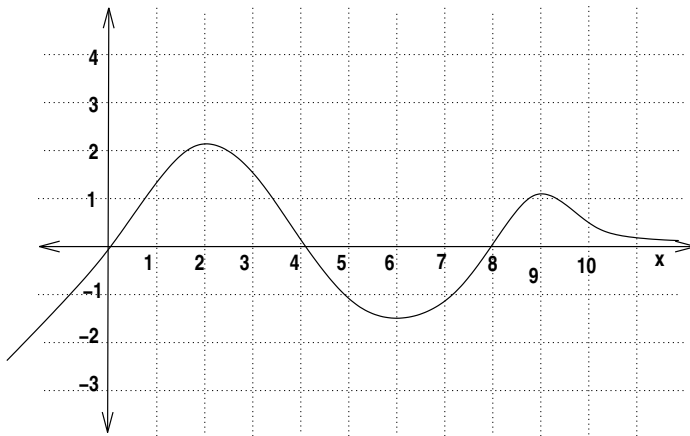
    (a) On what intervals is $f(x)$ increasing?

    (b) On what intervals is $f(x)$ decreasing?

    (c) On what intervals is $f(x)$ concave up?

    (d) On what intervals is $f(x)$ concave down?

    (e) Use the above information to sketch a graph of $f(x)$.