Homework 4

§2.5#1, 3, 5, 19, 21, 29, **4**, **14**, **16***

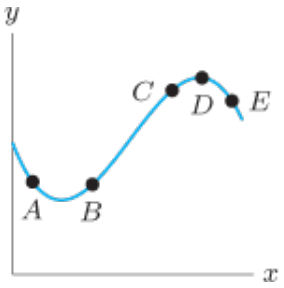
Review-ch2 #51, §3.9#8, 15, 18, 25, Review-ch2 #**24**, **50**, §3.9#**4**

§2.5 #1. Fill in the blanks:

a) If f'' is positive on an interval, then f' is _____ on that interval, and f is _____ on that interval.

b) If f'' is negative on an interval, then f' is _____ on that interval, and f is _____ on that interval.

§2.5 #3. At one of the labeled points on the graph, both $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ are positive. Which is it?



§2.5 #5. Graph each of the functions described:

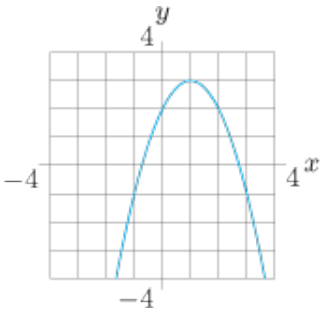
a) First and second derivatives everywhere positive

b) Second derivative everywhere negative; first derivative everywhere positive

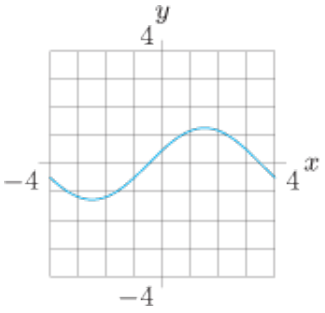
c) Second derivative everywhere positive; first derivative everywhere negative

d) First and second derivatives everywhere negative

§2.5 #19. Graph the second derivative of the function:



§2.5 #21. Graph the second derivative of the function:



§2.5 #29. The graph gives the position, $f(t)$, of a particle at time t. At which of the marked values of t are the following statements true?

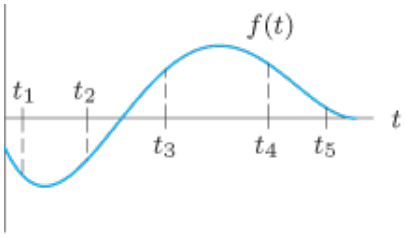
a) The position is positive

b) The velocity is positive

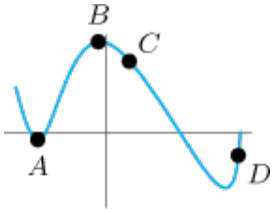
c) The acceleration is positive

d) The position is decreasing

e) The velocity is decreasing



§2.5 #**4**. At exactly two of the labeled points in the figure below, the derivative f' is zero; the second derivative f'' is not zero at any of the labeled points. Determine the signs of f, f', f'' at each marked point.

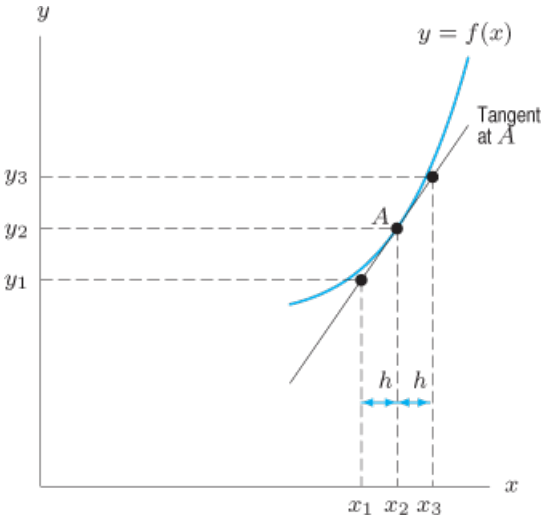


§2.5 #**14**. The position of a particle moving along the x-axis is given by $s(t) = 5t^2 + 3$. Use the limit definition of the derivative to find the velocity $v(t)$ and acceleration $a(t)$.

§2.5 #**16***. An accelerating sports car goes from 0 mph to 60 mph in five seconds. Its velocity is given in the following table, converted from mph to ft/s, so that all time measurements are in seconds. Find the average acceleration of the car over the first two seconds.

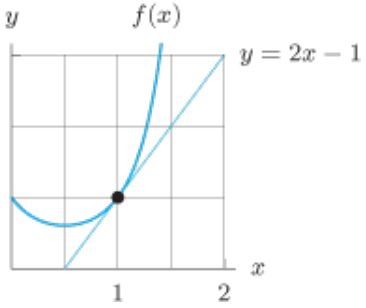
Time, t (sec)	0	1	2	3	4	5
Velocity, $v(t)$ (ft/s)	0	30	52	68	80	88

Review-ch2 #51. At a point A, we are told that $x = 1$. In addition, $f(1) = 3$, $f'(1) = 2$, and $h = 0.1$. What are the values of $x_1,\ x_2,\ x_3,\ y_1,\ y_2,\ y_3$?



§3.9 #8. Local linearization gives values too small for the function x^2 and too large for the function $\sqrt{x}$. Draw pictures to explain why.

§3.9 #15. The graph shows $f(x)$ and its local linearization at $x = a$. What is the value of a? Of $f(a)$? Is the approximation an under- or overestimate? Use the linearization to approximate the value $f(1.2)$.



§3.9 #18. a) Given that $f(7) = 13$ and $f'(7) = -0.38$, estimate $f(7.1)$.

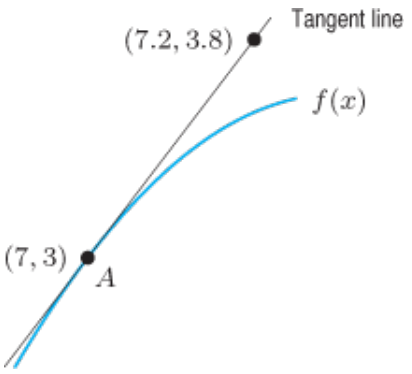
b) Suppose also that $f''(x) < 0$ for all x. Does this make your answer to part a) and under- or overestimate?

§3.9 #25. Suppose f has a continuous positive second derivative for all x. Which is larger, $f(1 + \Delta x)$ or $f(1) + f'(1)\Delta x$? Explain

Review-ch2 **#24**. Find the derivative of $f(x) = x^2 + 1$ at $x = 3$ algebraically. Find the equation of the tangent line to f at $x = 3$.

Review-ch2 **#50**. Use the figure to fill in the blanks in the following statements about the function f at the point A.

a) $f(\_\_\_) = \_\_\_$ b) $f'(\_\_\_) = \_\_\_$



§3.9 **#4**. Find the local linearization of $f(x) = x^2$ near $x = 1$.