Chapter 2: Derivatives

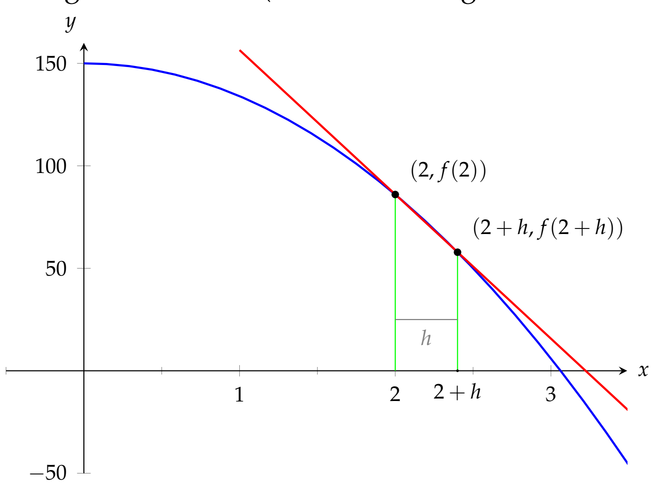
Section 2.1 Instantaneous Rates of Change: The Derivative

All page numbers refer to original APEX text page numbers.

p. 57, Paragraph 2 typo: "...150 feet. Students of physics..."

p. 58

Move current Figure 2.1 up then add this graph in the margin near difference quotient - refer to it as Figure 2.2 in text (then current Figure 2.2 becomes 2.3, etc)



Below the difference quotient replace "where h is small" with "where h is the change in time after 2 seconds."

p. 59
If space under Figure 2.2 (soon to be 2.3) is still there try to remove it.

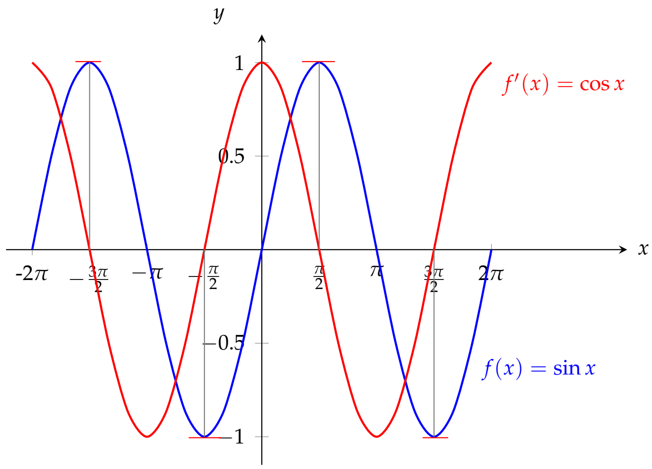
p. 60
In "Definition 7 Derivative at a Point" box: Move the text "If the limit exists, we say that f is differentiable... then f is differentiable on I." outside of the box - between Def 7 & Tangent Line definition.

pp. 61 - 62
Cut "Another important line that can be created...Definition 9 Normal Line...Example 33" and all text related to this topic & remove Figure 2.4.

p. 65
Example 37: in the sentence, "Now find common denominator..." replace "pull" with "factor.

p. 66
Example 38 delete ! after $= \cos x$.

Tim - I don't like the length of the positive x-axis but it needed to be that long to see the label for cos x. Do you know of another way to do this?



The figure label could be: Figure WHATEVER: The function $f(x) = \sin x$ and its derivative $f'(x) = \cos x$.

This picture should go next to this paragraph that replaces the paragraph beginning with "We have found that when...":

We have found that when $f(x) = \sin x, f'(x) = \cos x$ (see Figure WHATEVER). Initially, this might be somewhat surprising; the result of a tedious limit process and the sine function is a nice function. Then again, perhaps this is not entirely surprising. The sine function is periodic - it repeats itself on regular intervals. Therefore its rate of change also repeats itself on the same regular intervals. In fact, if we think about $f'(x)$ as the slope of the tangent to the sine curve we notice the following

- if the slope of tangent lines is 0 then $f'(x) = \cos x$ crosses the $x-$axis;
- if the slopes of the tangent lines are positive then f' lies above the $x-$axis; and
- if the slopes of the tangent lines are negative then f' lies below the $x-$axis.

We should have known the derivative would be periodic; we now know exactly which periodic function it is.

p. 67
Insert bracketed word [ ]: in paragrah starting with "Since $x = 0$ is the point where our function's definition switches from one piece to [the] other,..."

p. 68
In Solution at topic of page change $\lim_{x \to 0}$ of the difference quotients to $\lim_{h \to 0}$.

Exercises 2.1
For exercises $6-12$ change the directions to:
In exercises $6-$?? (a) use the definition of the derivative to compute the derivative function. (b) Find the tangent line to the graph of the given function at $x = c$.
The problems should appear in the following order. #6-9 are the same as before. I added problems 10, 12, and 14 and all independent variables are x:
6. $f(x) = 6$ at $x = -2$

7. $f(x) = 2x$ at $x = 3$

8. $f(t) = 4 - 3x$ at $x = 7$

9. $g(x) = x^2$ at $x = -2$

10. $h(x) = 2x - x^2$ at $x = 1$

11. $f(x) = 3x^2 - x + 4$ at $x = -1$

12. $g(x) = \sqrt{x+3}$ at $x = 1$

13. $r(x) = \dfrac{1}{x}$ at $x = -2$

14. $h(x) = \dfrac{3}{\sqrt{x}}$ at $x = 4$

15. $f(x) = \dfrac{1}{x-2}$ at $x = 3$

Answers

7. (a) Same as current
(b) $y = 2x$

9. (a) Same as current
(b) $y = -4x - 4$

11. (a) $f'(x) = 6x - 1$
(b) $y = -7x + 1$

13. (a) Same as current
(b) $y = -\frac{1}{4}x - 1$

15. (a) Same as current
(b) $y = -x + 4$

New section of problems:
Each limit represents the derivative of some function, f, at some number c. State an appropriate f and c for each.

16. $\lim\limits_{h\to 0} \dfrac{\sqrt{16+h} - 4}{h}$

17. $\lim\limits_{h\to 0} \dfrac{(3+h)^4 - 81}{h}$

18. $\lim\limits_{h\to 0} \dfrac{\frac{1}{x+h} - 2}{h}$

19. $\lim\limits_{h\to 0} \dfrac{\cos(-\pi + h) + 1}{h}$

Answers

17. $f(x) = \sqrt{x}, c = 16$

19. $\frac{1}{x}, c = \frac{1}{2}$

After current #20 (still #20) insert new #21 $f(x) = \sqrt{x}, x = 4$