# Math 1 Lecture 16

Dartmouth College

Monday 10-17-16

# Contents

# Reminders/Announcements

- WebWork due Wednesday
- Written Homework due Wednesday
- Exam#2 is Thursday 10/20/16 and will cover material from Trigonometry up to and NOT including derivatives
- Exam review during $x$-hour 10/20/16
- Exam Review Slides:
  `https://math.dartmouth.edu/~m1f16/MATH1Docs/Musty-x-hour-Slides-10-13-Thur.pdf`
- Because of the exam there will be no WebWork due Friday 10/21/16

# The Derivative of $f$ at $a$

Let $a$ be in the domain of $f$. We define the **derivative of $f$ at $a$** by

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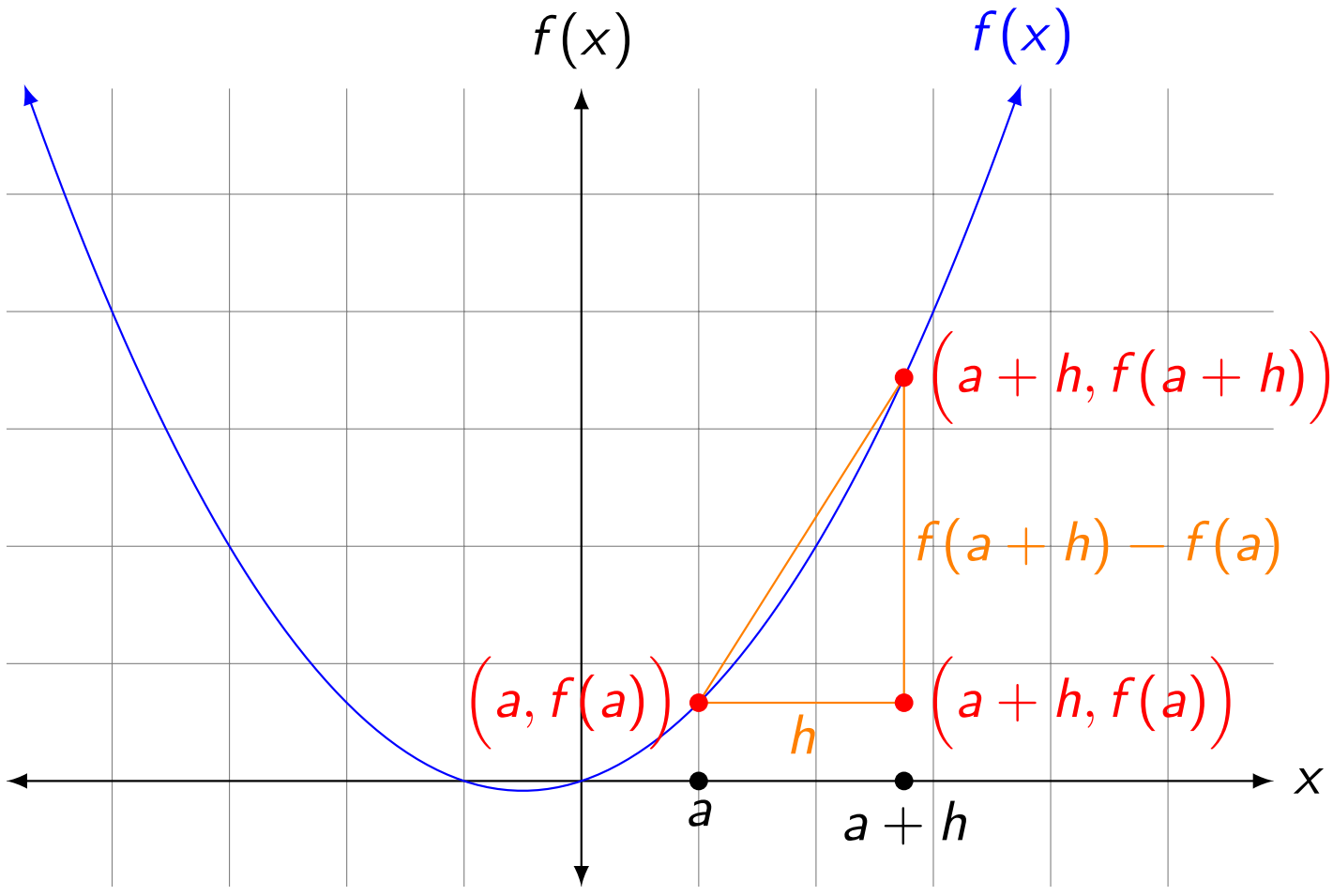
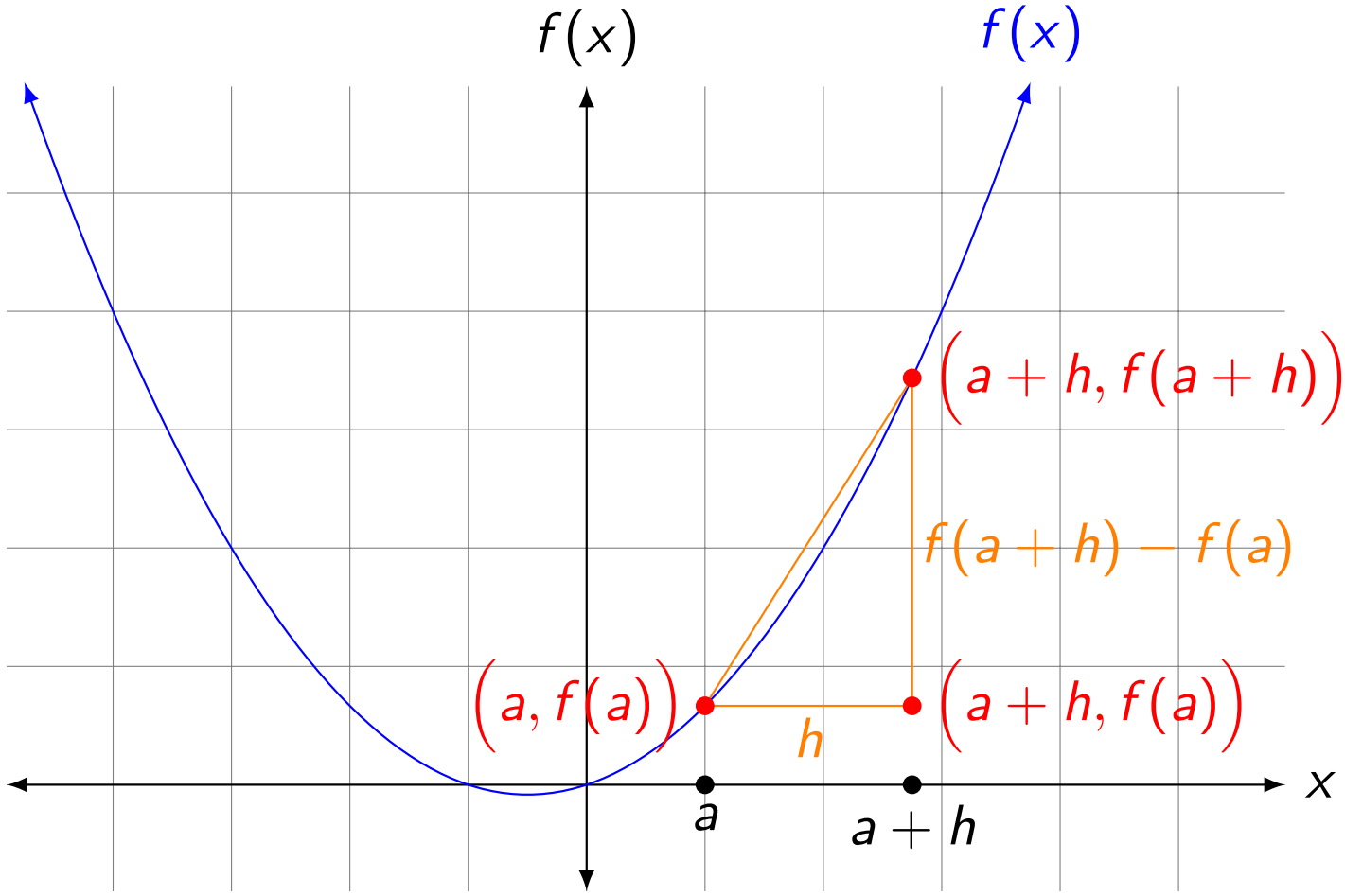

$f(x)$
$f(x)$
$\big(a+h, f(a+h)\big)$
$f(a+h)-f(a)$
$\big(a, f(a)\big)$
$h$
$\big(a+h, f(a)\big)$
$x$
$a$
$a+h$




What happens to $\frac{f(a+h)-f(a)}{h}$ as $h \to 0$?

Let $f(x) = x^2$. Please find $f'(3)$.

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**Solution:**

$f'(3) = 6$.

Let $f(x) = \sqrt{x}$. Please find $f'(5)$.

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**Solution:**

$f'(5) = \sqrt{5}/10$.

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**Solution:**

$f'(-2) = -1/4$.

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$s'(1) = 6.28$.

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**Solution:** $s'(a) = 10 - 3.72 \cdot a$.

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**Solution:** When $t = 500/93 = 5.37634408602151$ seconds.

With what velocity will the rock hit the surface?
**Solution:**
$s'(500/93) = -10$.

The position in feet of a particle moving in a straight line for $t$ seconds is given by $s(t) = \frac{1}{2}t^2 - 6t + 23$.

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**Solution:**
$v(8) = s'(8) = 2$.

What is the equation of the line tangent to the graph of $s$ at the point $(8, s(8))$?
**Solution:**
$y - 7 = 2(x - 8) \implies y = 2x - 9$.

Suppose the function $f(x)$ has a tangent line at the point $(4, 3)$ (i.e. $f(4) = 3$) passes through the point $(0, 2)$. Find $f'(4)$.

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**Solution:** $f'(4) = 1/4$.

Write the following limit as $f'(a)$ for some $f$ and some $a$.

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$$\lim_{h \to 0} \frac{\sqrt{9+h} - 3}{h}.$$

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**Solution:**

$$\lim_{h \to 0} \frac{\sqrt{9+h} - 3}{h} = f'(a)$$

for $f(x) = \sqrt{x}$ and $a = 9$.