Teaching and Tutoring Math Online

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Synchronous Teaching and Tutoring

Hendrick Best Practices for Adult Learners Conference

May 10, 2010
Penn State University
Teaching
Three Basic Tools

- ANGEL
- WeBWorK
- Adobe Connect
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Download Hardcopy for Selected Sets
### Basic Derivatives

Download a hardcopy of this homework set

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This set is visible to students.

**WebWork** assignment number Basic_Derivatives is due: 02/03/2006 at 10:00pm EST.

The [*replace with url for the course home page*] contains the syllabus, grading policy and other information.

This file is /conf/snippets/webHeader.pg you can use it as a model for creating files which introduce each problem set.

The primary purpose of WebWork is to let you know that you are getting the correct answer or to alert you if you are making some kind of mistake. Usually you can attempt a problem as many times as you want before the due date. However, if you are having trouble figuring out your error, you should consult the book, or ask a fellow student, one of the TA's or your professor for help. Don't spend a lot of time guessing -- it's not very efficient or effective.

Give 4 or 5 significant digits for (floating point) numerical answers. For most problems when entering numerical answers you can if you wish enter elementary expressions such as $2 \times 3$ instead of 6, $\sin(3 \times \pi/2)$ instead of -1, $e \times (\ln(2))$ instead of 2, $(2 + \tan(3)) \times (4 - \sin(5)) \times 0 - 7/8$ instead of 2760.3413, etc. Here's the list of functions which WebWork understands.

You can use the Feedback button on each problem page to send e-mail to the professors.

Hendricks 2010 Boman and Smith
Basic Derivatives: Problem 4

Let \( y = x^7 \). Find \( \frac{dy}{dx} \).

\[
\frac{dy}{dx} = 7x^6
\]

Edit this problem

- Show correct answers
  - Preview Answers
  - Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Show Past Answers

Email instructor

This set is visible to students.
Basic Derivatives: Problem 4

ANSWERS ONLY CHECKED -- ANSWERS NOT RECORDED

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<tr>
<th>Entered</th>
<th>Answer Preview</th>
<th>Result</th>
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<tbody>
<tr>
<td>7*(x^6)</td>
<td>7x^6</td>
<td>correct</td>
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</tbody>
</table>

The answer above is correct.

(1 pt) unionLibrary/setDervBasic/3-4-03.pg

Let \( y = x^7 \). Find \( \frac{dy}{dx} \).

\[
\frac{dy}{dx} = 7x^6
\]

Edit this problem

You have attempted this problem 0 times.
This homework set is closed.

Show Past Answers
Email instructor

This set is visible to students.
Ex: Find all extrema of

\[ p(x) = \frac{1}{3} x^3 - 2x^2 + 3x + 1 \]

Critical points

\[ f'(x) = x^2 - 4x + 3 = 0 \]

Solutions

\[ (x-3)(x-1) = 0 \]

\[ x = 1 \]

\[ x = 3 \]

Second Derivative Test

\[ f''(1) = -2 < 0 \quad \text{max at } x = 1 \]

\[ f''(3) = 6 - 4 = 2 > 0 \]
Critical Points include points where $g'(x)$ not exist.

$$g(x) \ [{-2, 2}]$$
Ex: 3 P81 40 ft of fencing

\[ x + x + y = 40 \quad \Rightarrow \quad y = 40 - 2x \]

\[ 2x + y = 40 \]
Why online?
  Convenience
  Equity
  Accreditation
Multiple Populations

Adult Learners in face-to-face classes

Face-to-face possible but inconvenient

Meet during lunch hour
As child is napping
At the airport
Etc.

Students in an on-line class

Face-to-face not possible
Geographically dispersed

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Online Misconceptions

What’s the turn-around time?

Can’t I just email the paper or send you the homework problem?
Guiding Principles

1. Minimize differences in technology tools between student and tutor

2. Student an active participant
   • Keep it similar to face-to-face interactions
   • Resist editing or telling

3. Success depends on process, not the tools used (Turrentine & MacDonald, 2006)
   • Define what can/cannot be accomplished
   • “see and hear” each other without video or sound; especially careful with tone if using chat only
   • Same face-to-face best practices in tutoring process

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Practical Considerations

1. Professor/Tutor collaborations
   - Embed tutoring information into the course
   - Know assignments
   - Tutor has an online presence in the class
Learning Center Information

Any concerns or questions - Contact Janice Smith jes57@psu.edu or 717-948-6296

Scheduling a virtual math tutoring session using Adobe Connect
Tutor is Janice Smith of the Learning Center

Learning Center Web page link
See all the services of the Learning Center here.

But I understood it in class!
You can't get exercise by watching an exercise video!

If you have any questions, please contact Angel Support
Example: Absolute Value

\[ f(x) = |x| = \begin{cases} 
  x & \text{if } x \geq 0 \\
  -x & \text{if } x < 0 
\end{cases} \]

| x  | y = |x| |
|----|-----|
| 0  | 0   |
| 1  | 1   |
| -1 | 1   |
| -2 | 2   |
Practical Considerations (con’t)

2. Options for chat or audio
   • Audio required for math
   • Tutor used headset with microphone
   • Students had audio and mic capabilities (could use chat function)
Practical Considerations (con’t)

3. Transparent technology platform
   - Match the class platform if possible
     - More important in math than writing support
     - Use Adobe Connect
   - Use of a tablet mouse for math (THANKS to the Commission for Adult Learners Incentive Grant)
     - Ask the student what to write as the next step or symbol

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Bounded Area:

\[ y = 3x^3 - x^2 - 10x \]

\[ y = -x^2 + 2x \]

\[-x^2 + 2x = \frac{3x^3}{x} - \frac{x^2}{x} - 10x\]

\[-2x = 3x^3 - 12x = 0\]

\[3x(x^2 - 4) = 0\]

\[3x = 0\]

\[x = 0\]

\[x = 2\]

\[x = -2\]
Practical Considerations (con’t)

4. Approval for Alternate Work Arrangements
   • Wage payroll tutors working from home

5. Adobe Connect license needed
   • From IT department
Pilot for math (summer 09)

- Math 110 (entirely online)
  - 11 enrolled students
  - 4 tutored (3 adult learners)
- 3 other math courses (face-to-face)
  - 2 students tutored online (1 adult learner)
  - One calculus, one algebra
Needed

- Publicity for online tutoring option for face-to-face courses
  - Not yet in the campus culture
- Training for tutors
  - Must be experienced in face-to-face tutoring
References
