

## CS 206 Homework 4

Your name:

Due: Thursday, October 20.

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### **Instructions**

Do all of your work in this Maple worksheet. If you are asked to explain something, type your explanation in this worksheet. Do not give the most terse answer that you can think of. Try to give a full explanation of whatever is being asked. Your explanations should be clear, well written, and make use of proper spelling, punctuation, grammar, etc. Make your explanations as presentable as possible. Make use of Maple's basic formatting and word processing abilities. (*Do not* put your explanations on a Maple command line after a prompt.)

If you need to do a calculation, you should use Maple to do the calculation here in this worksheet. Do not do a calculation on a handheld calculator and then copy the result into this worksheet.

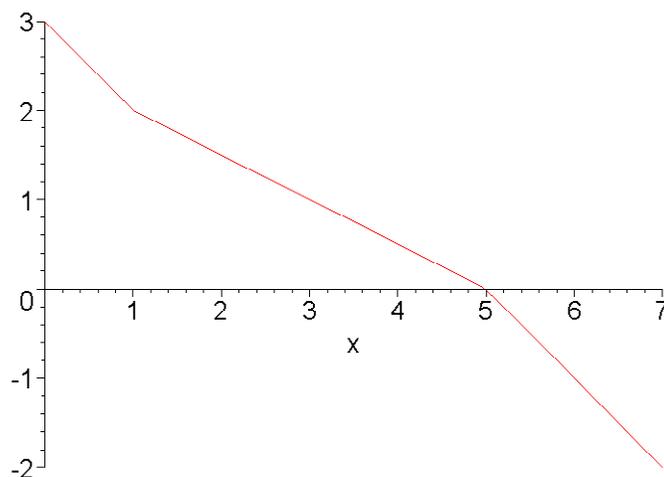
If you need more Maple prompts for commands, use Ctrl-j to create a new prompt.

Be sure to save your worksheet (as a "classic worksheet") as you work on it.

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### **Problem 1**

Use a **plot**-valued function that, along with a **seq** and a **display** command, creates the following animation of a piecewise defined function. Your animation should have about 60 frames.



Hint: Solve this problem in steps. First, define a piecewise defined function with two inputs, **x**, which should be the independent variable of the function in the animation, and **t**, which is the

"time" parameter which should cause the piecewise defined function to change appropriately as the animation evolves.

```
[ > pw := (x,t) -> piecewise( );
```

Test your definition of `pw` to see if it properly draws frames from the animation.

```
[ > plot( pw(x,0), x=0..7 ); # should draw first frame from
animation
[ > plot( pw(x,1), x=0..7 ); # should draw one of the middle frames
from animation
[ > plot( pw(x,2), x=0..7 ); # should draw last frame from
animation
```

When you are pretty sure that your parameterized piecewise function is correct, use it in a `plot`-valued function, `seq`, `display` command to draw the animation.

```
[ > p := t -> plot( );
[ > seq( p( ), t=0..60 ):
[ > plots[display]([%], insequence=true, scaling=constrained );
[ >
```

```
[ >
```

## **- Problem 2**

For each of the following four functions, use the information from Section 5.2 of Worksheet 5 to describe what kind of function it is, describe what kind of graph is appropriate for that kind of function, and use an appropriate Maple command to draw a graph for the function.

**Part (a).**  $f(z) = (\cos(z), \sin(z), \cos(z)^3 \sin(4 \sin(z)) + \sin(z)^2 \cos(3 \cos(z)))$

**Part (b).**  $g(u, v) = (\ln(1 + v^2), \ln(1 + u^2))$

**Part (c).**  $h(x, y) = (\cos(x) \sin(2y), \sin(x) \sin(2y), \sin(y))$

**Part (d).**  $k(x) = (x - 2 \sin(x), 1 - 2 \cos(x))$

NOTE: Draw *good* graphs for these functions. Make each of your graphs as expressive as possible by carefully choosing ranges. You will need to experiment with the ranges. If you choose poor ranges, your graphs could end up being incomplete and/or distorted and misshaped. Be sure to try a variety of ranges before you settle on your final graph.

```
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```

```
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```

## **- Problem 3**

Define functions  $f$ ,  $g$ , and  $h$  by

$$f(t) = (t^3 - 2t, t^2 - t)$$
$$g(u, v) = ((2 + \cos(v)) \cos(u), (2 + \cos(v)) \sin(u), \sin(v))$$

$$h(x, y, z) = x y z.$$

Represent these functions in Maple as Maple functions **f**, **g**, and **h** using the arrow operator. Use appropriate graphing commands to draw graphs for each of the functions **f**, **g@f**, **h@g**, and **h@g@f**. Your graphing commands should make explicit use of the notation **g@f**, **h@g**, and **h@g@f**. Draw only *good* graphs for these functions. That is, your graphs should give a realistic sense of the shape of these functions. If you want to, give more than one graph of each function, but do not give more than three graphs of a particular function. Make each of your graphs as expressive as possible by carefully choosing ranges that get as much *meaningful* information as you can into each graph.

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