

In-Class Activities

Mathematics Department
Fort Lewis College

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These activities are designed to be used in class to help students understand the material. They are not graded, but students are encouraged to work on them in groups and ask the instructor for help when needed.

Math 113 Function Intro Worksheet

Objectives

- Use an externally generated image in an exercise.
- Use an internally generated table in an exercise.
- Use an ordered list for enumeration within an exercise.

In this worksheet we will work with function notation and see a couple Pretext techniques. The exercises are from the active learning ancilliary materials from *Functions Modelling Change: A Preparation for Calculus* by Connally et al.

1. Use the figure below to fill in the missing values.

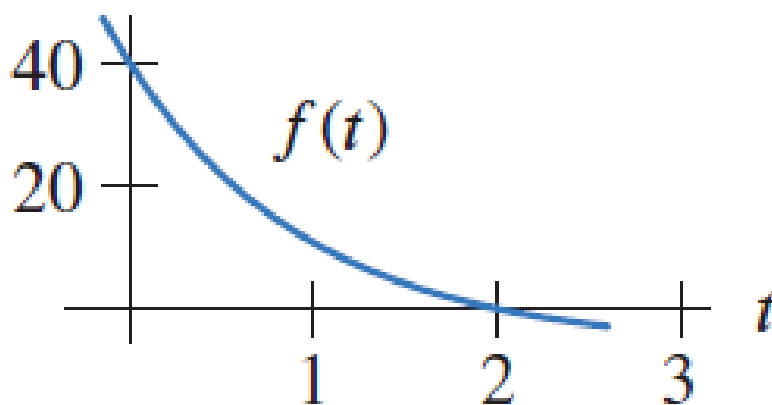


Figure 1 Graph saved in assets as .png from outside source.

- (a) $f(0) = ?$
- (b) $f(?) = 0$

2. Data for rainfall, $R = f(t)$, in Tucson, Arizona is given in [Table 2](#) below, where time, t , is in months with $t = 1$ being January.

Table 2

t (months)	1	2	3	4	5
R (inches)	0	0.1	0.54	0.1	0.35

- (a) Find and interpret $f(5)$.

- (b) Solve $f(t) = 0$ and interpret the meaning of your answer.

- (c) Solve $f(t) = 0.1$ and interpret the meaning of your answer.

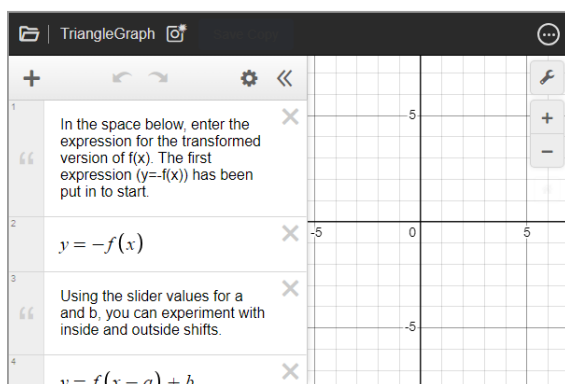
Math 121 Graphical Transformation Worksheet

Objectives

- Include an interactive (Desmos) in an activity with a QR code available for the print version.
- Note how to include QR codes for interactives in print versions of worksheets.
- Discuss creating individual pdf versions of worksheets to hand out in class.

This activity asks students to describe the effect of different affine transformation of functions after experimenting with Desmos. The pre-built Desmos graph appears in the html version while a QR code is created in the print version.

1. Use the interactive Desmos graph given above with sliders for a and b to describe the effect of each algebraic substitutions on the graph of $y = f(x)$.



Standalone

Figure 3 Note: frhv1grqhj is the last part of the Desmos graph. When you modify the Desmos graph and re-save it, that may change the url.

- (a) $f(-x)$ has the same graph as $f(x)$, except _____.
- (b) $-f(x)$ has the same graph as $f(x)$, except _____.
- (c) $f(x - a)$ has the same graph as $f(x)$, except _____.
- (d) $f(x + a)$ has the same graph as $f(x)$, except _____.
- (e) $f(x) + b$ has the same graph as $f(x)$, except _____.
- (f) $f(x) + b$ has the same graph as $f(x)$, except _____.

Interactive Remarks

Remark 4 Obviously, interactive elements don't work very well in printed worksheets. When you print a worksheet you can have it include a static screenshot of the given interactive as well as a QR code to the interactive (still within your pretext book). To do this, you need to edit the file `publication-standalone.ptx`. In this file, find the `html` section and edit the `baseurl` entry to be the url of your deployed Pretext project with `/worksheets` at the end.

Remark 5 The ability to print directly from html versions of worksheets isn't great. Hence, if you want to hand out worksheets in class, you will need to do the following:

- Uncomment the `pretext` and `article` tags at the top and bottom of the worksheet's ptx file.
- Run the command `pretext build pdf -i ./source/activities/121samplewsht.ptx` (change file name to your worksheet) to generate a pdf version and print the worksheet you want.

Now your worksheet will appear in `output/pdfs`.

Remark 6 For further discussion of interactive elements, go to [pretextinteractiveelementexamples](#).

Math 221 Tangent Line Worksheet

Objectives

- Show how to include an image using Prefigure code.
- Show displayed and aligned math as well as some minor math typesetting issues that come from xml syntax (see the code for details).

In this activity students are asked to decide when to switch the tangent line approximation they use to approximate square roots.

Set-up. Recall from class that we can approximate square roots of numbers that aren't perfect squares using the tangent line approximation near some number a

$$L_a(x) = f(a) + f'(a)(x - a)$$

where $f(x) = \sqrt{x}$.

For instance, to approximate $\sqrt{5}$ we decided to use the tangent line approximation at the nearest perfect square, which is given by

$$\begin{aligned} L_4(x) &= \sqrt{4} + \frac{1}{2\sqrt{4}}(x - 4) \\ &= 2 + \frac{1}{4}(x - 4) \\ &= 1 + \frac{1}{4}x. \end{aligned}$$

Thus, we can estimate $\sqrt{5} = f(5) \approx L_4(5) = 2.25$.

Now, what if there isn't a "nearest" perfect square? For instance, which tangent line should we use to approximate $\sqrt{6.5}$ (6.5 is exactly halfway between 4 and 9)? The following exercise will help us figure out the answer.

1. The graph of $f(x) = \sqrt{x}$, along with its tangent lines at $x = 4$ and $x = 9$, is given by [Figure 7](#).

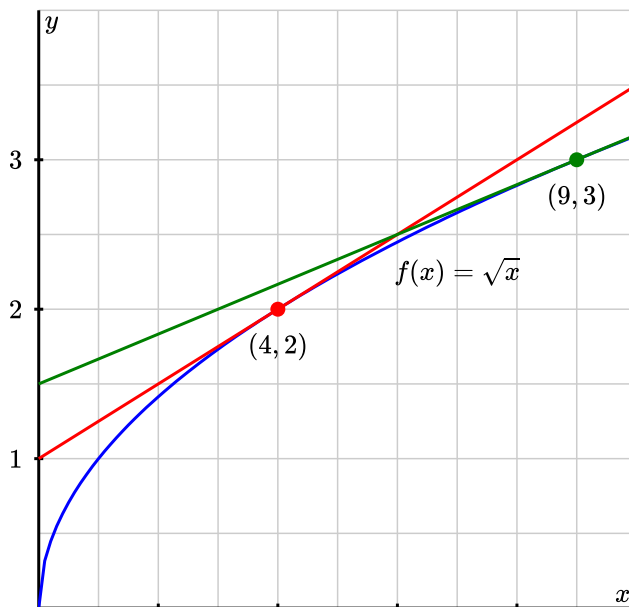


Figure 7 The graph of $f(x) = \sqrt{x}$ and its tangent line approximations at $x = 4$ and $x = 9$.

- (a) Use [Figure 7](#) to give intervals of x -values on which $L_4(x)$ and $L_9(x)$ give more accurate estimates of \sqrt{x} . That is, find some x -value, s , such that

$$|\sqrt{x} - L_4(x)| < |\sqrt{x} - L_9(x)|$$

whenever $x < s$ and

$$|\sqrt{x} - L_9(x)| < |\sqrt{x} - L_4(x)|$$

whenever $x > s$.

- (b) Use algebra to justify your answer above.

Interactive Remarks

Remark 8 Note the issues in the code where Latex syntax conflicted with xml. There are a few instances when these happen.

Remark 9 Prefigure is really more intuitive to use than Tikz and generates more accessible images. Full documentation is available at [PrefigureDocumentation](#) and a very convenient tool for testing your figures is available at [PrefigurePlayground](#).

Math 222 Series Test Worksheet

This is the introduction to the activity.

1. This is the first exercise.