

1. [5] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F.

T F $\frac{1}{\frac{a}{2}} = \frac{2}{a}$

T F If $r(x) = \frac{x-2}{5x}$, then the inverse to r is $r^{-1} = \frac{5x}{x-2}$.

T F $x^2 + 4x + 3$ divides $2x^4 + 6x^3 + 2x + 6$.

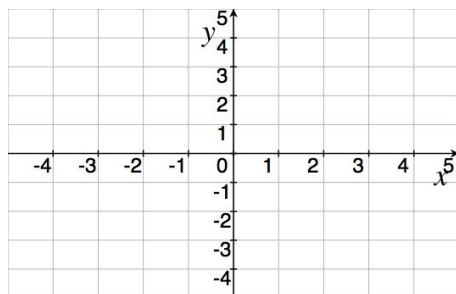
T F $(2 + i) - (3 + i) = -1$.

T F $(2 + i)(3 + i) = 6 + i$.

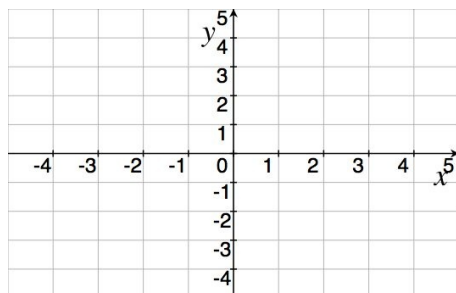
Show all your work. Reasonable supporting work must be shown to earn credit.

2. Provide a graph AND an algebraic rule/expression for each of the functions described:

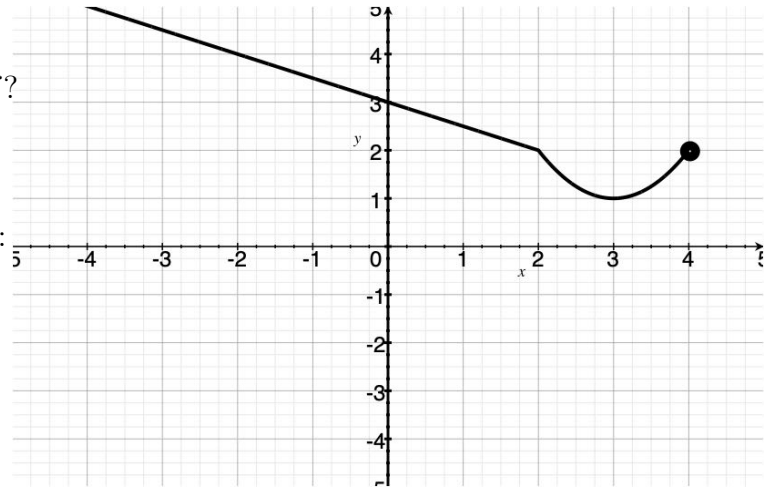
- (a) [4] (PolyActivity#4) A degree 4 polynomial whose only roots are -2 , 1 and 4 .



- (b) [4] (§2.1#32) A quadratic with vertex $(-2, 3)$ and vertically stretched by 2.



3. Let f be the piece-wise defined graph comprised a line and one parabola below.



(a) [2] (Quiz2#1) Find the range of f ?

(b) Estimate the following *if* possible:

i. [1] (Quiz1 #1) $f(-2)$

ii. [2] (WebHW3 #2)
 $(f + f)(-2)$

iii. [2] (WrittenHW§1.6 #68) $(f(f(0)))$

iv. [1] (WrittenHW§1.1 #104) The minimum of f .

v. [2] (PracticeExam1 #6) All possible x such that $f(x) = 2$.

(c) [4] (Quiz2#1) Find the piece-wise defined algebraic rule for f of the form:

$$f(x) = \begin{cases} & x \leq 2 \\ & 2 < x \leq 4 \end{cases}$$

(d) [3] (WebHW1.5 #9) Graph $-f(x) + 2$ on the axes above.

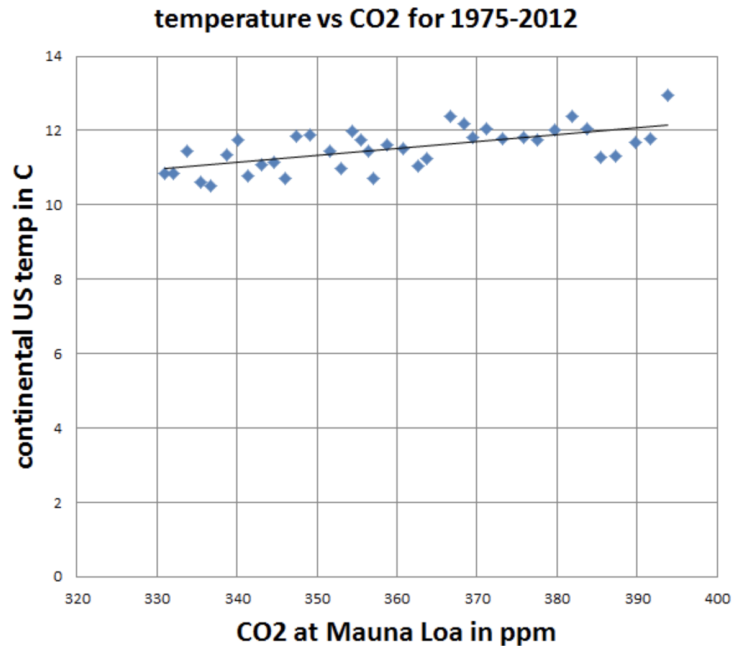
4. (Dr. Archey's Blog) Consider the following data collected from http://www.esrl.noaa.gov/gmd/dv/data/index.php?site=mlo¶meter_name=Carbon%2BDioxide&frequency=Monthly%2BAveragesandhttp://www.ncdc.noaa.gov/cag/.

Each year's average CO_2 levels measured at Mauna Loa, HI and average continental US temperature (in Celsius) were plotted on the axes below. Additionally the linear model that best fits the data was graphed. The equation of the line is $L(x) = .019x + 4.76$.

(a) [2] (Quiz1#1) Is L a function? Why or why not?

(b) [1] (§1.2#106) What are the units for the slope?

(c) [1] (LineActivity#7) What does the slope mean in real world terms?



(d) [2] (WebHW2#1) Assuming L is a reasonable approximation between CO_2 levels and average continental temperatures, what would the continental temperature of the US be when/if CO_2 levels reach 400 ppm?

(e) [3] Find the y intercept and interpret in real world terms. Do you think your interpretation is reasonable? Why or why not?

(f) [2] (InverseActivity#1) Describe the inverse function L^{-1} by identifying the inputs and outputs.

5. [4] (PracticeExam #3) Find any real or imaginary solutions to

$$\frac{2}{x+2} = \frac{1}{x+1} + \frac{3}{5}$$

6. (WordProblems#8) Potassium ferrate has been considered for use in batteries but costs \$16 per gram. You have a battery case that is currently *full* with 50 grams of a mixture that is 10% potassium ferrate.
- (a) [3] Find an expression for the percentage (as a decimal) of potassium ferrate in the battery case as a function of how much potassium ferrate is added. Note you might need to make room in the battery case before something can be added.
- (b) [2] You would like to build the battery but you need a higher concentration of the potassium ferrate (40% should do it). What is the minimum amount of potassium ferrate you have to buy and add to the battery case to get the cathode to work?