Exam 1 **TMath 120** Fall 2013

NAME:

1. TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f be a function, and x, y, and z be real numbers with $z \neq 0$.

   T F $\dfrac{1}{x} + \dfrac{2}{x+1} = \dfrac{4}{x+1}$

   T F $(f \circ f)(x) = f(x) \cdot f(x)$

   T F The lines defined by $3x - 7 = y$ and $2y + 6x = 5$ are parallel.

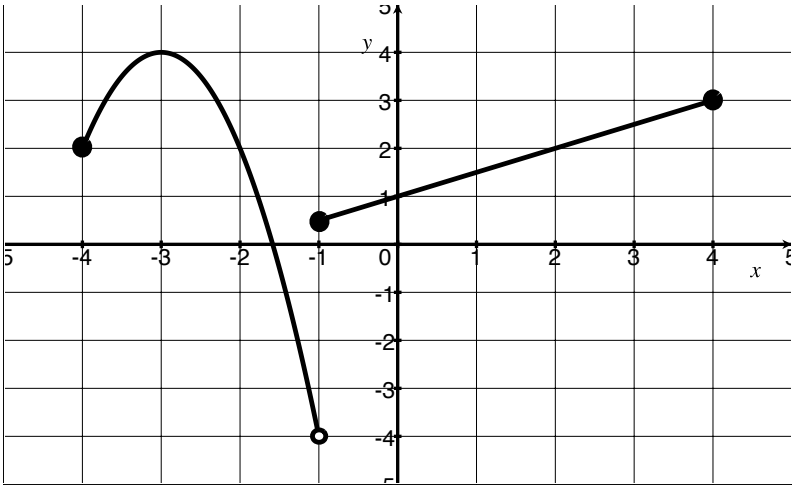
   T F $(2 + i) - (5 - i) = -3 + 2i$

   T F The vertex is the extrema (min or max) of a quadratic function.

   Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

2. [4] (Practice Exam #2) Find any real or imaginary x such that $\dfrac{1}{3} - \dfrac{1}{x-2} = \dfrac{1}{x}$.

3. Let f be the piece-wise defined function comprised a line and a parabola whose graph is below:



(a) Estimate the following *if* possible:

i. [1] (§1.3 #56) $f(4)$

ii. [1] (WebHW1 #16) the y-intercept

iii. [2] (PracticeExam #4) $(f \circ f)(-3)$

(b) [1] (transform Wks #5) Find the range of f.

(c) [2] (PracticeExam #6) Find all possible input(s) so that $f(x) = 2$.

(d) [2] (Inverse Wks #3) Does f have an inverse? Why or why not?

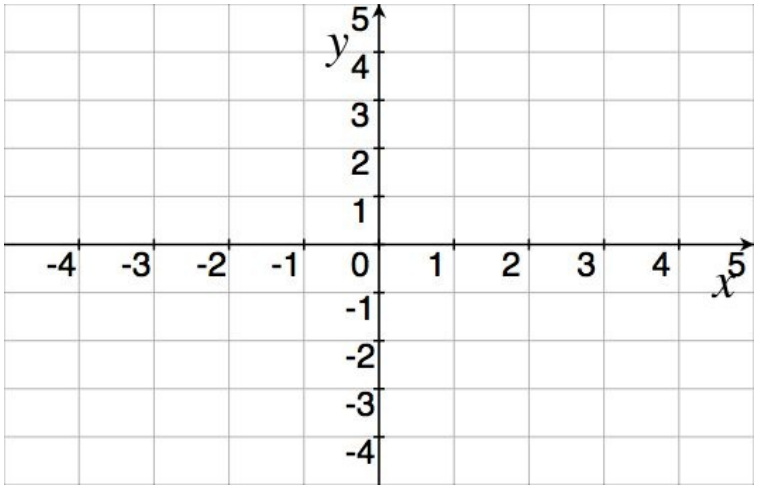
(e) [2] (Quiz2 #3) Find the average rate of change of f as x changes from -3 to 0.

(f) [5] (PracticeExam #4) Find the formula for f in the indicated form:

$$f(x) = \begin{cases} & \text{if } x < 1 \\ & \text{if } x \geq 1 \end{cases}$$

4. Let h be the *function* defined by:

$$h(x) = \begin{cases} x - 1 & -3 \le x \le 1 \\ (x-1)^2 & 1 < x \le 3 \end{cases}$$

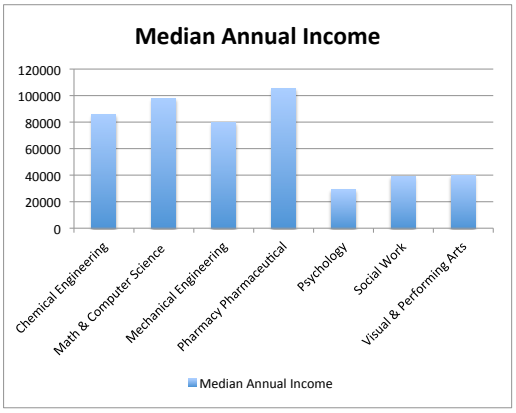


(a) [3] (WebHW1 #19) Graph h.

(b) [2] (InverseWks #2) Does h have an inverse? Why or why not?

(c) [3] (WebHW3 #6) The function m is defined by $m(x) = h(x-2)+1$. Graph m on the above set of axes.

5. (PracitceExam #9) Let the domain of f be undergraduate majors and $f(x)$ be the median annual earnings of people with the the undergraduate major x.



(a) [2] Is f a function? Why are why not?

(b) [4] Some data of f is shown in the graph on the right, what is f(Psychology) and what does it mean?

6. Let $\alpha(x) = \dfrac{x}{x+2}$ and $\beta(x) = 2 - \sqrt{x+1}$. Both α and β have inverses that exist.

   (a) [2] (§1.6 #20) Find $(\alpha - \beta)(x)$

   (b) [2] (§1.6 #38) $(\alpha \circ \beta)(x)$.

   (c) [1] (§1.7 #26) $(\alpha \circ \alpha^{-1})(\pi)$.

7. [1] (Word Problem Wks) A path that is 3 miles long starts at 1200 ft and ends at 1400 ft above sea level. How steep the assent (slope/average rate of elevation gain) of the path?.

8. [5] (Word Problem Wks) Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want to be considered for credit.
No, doing both questions will not earn you extra credit.

   (a) Seismic waves travel at about 4km/s but Megan has (a really fast!) carrier pigeon that travels 6km/s. Assume that Megan's first instinct when feeling a quake is to "tweet" the experience and that process (recognizing it's an earthquake, finding her carrier pigeon, attaching a message to the bird's leg, and the message being broadcast) takes 8 minutes. How far does a Megan follower have to be from Megan to know there is an earthquake before feeling it? (inspired by http://xkcd.com/723)

   (b) James T. Kirk is in this course and would like to know if it is still possible to earn a 2.5 now that he's taken two exams. He has looked at the gradebook on WebAssign and has computed the averages listed below.

   Assuming James' work does not drastically change in the remaining 3 weeks and his averages remain about the same, find what grade he needs to get on the final to receive a 2.0 in the course. In case you don't remember, the weights specified in the syllabus and the graph of the function f that takes your class percentage x and returns your score on a 4. scale are also provided.

	weight	James' ave
Mini-Quizzes	5%	95%
WebAssign	10%	10%
WrittenHW	15%	0%
Quizzes	15%	70%
2 Exams	30%	100%
Final	25%