

NAME:

1. [4] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F.

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

T F As $x \rightarrow \infty$, the output $f(x) = (x + 4)^2(x - 100)$ goes to ∞

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

T F The graph $g(x) = f(x + 1)$ is the graph of f but shifted left one unit.

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

2. (WebHW2.2 #17) The length of a rectangle is $x^2 - 2x + 4$ centimeters. The area of a rectangle is $4x^4 - 8x^3 + 21x^2 - 10x + 20$ square centimeters.

(a) [1] Find the area of the rectangle when $x = 1$.

(b) [3] Find the width of the rectangle as a function of x .

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

(a) [2] (FunctionActivity #4)

Is f a function? Why or why not?

(b) [2] (Quiz1#1) Find the range of f ?

(c) Estimate the following *if* possible:

i. [1] (Quiz1 #1) $f(-3)$

ii. [2] (WebHW§1.6 #1)
 $(f + f)(-3)$

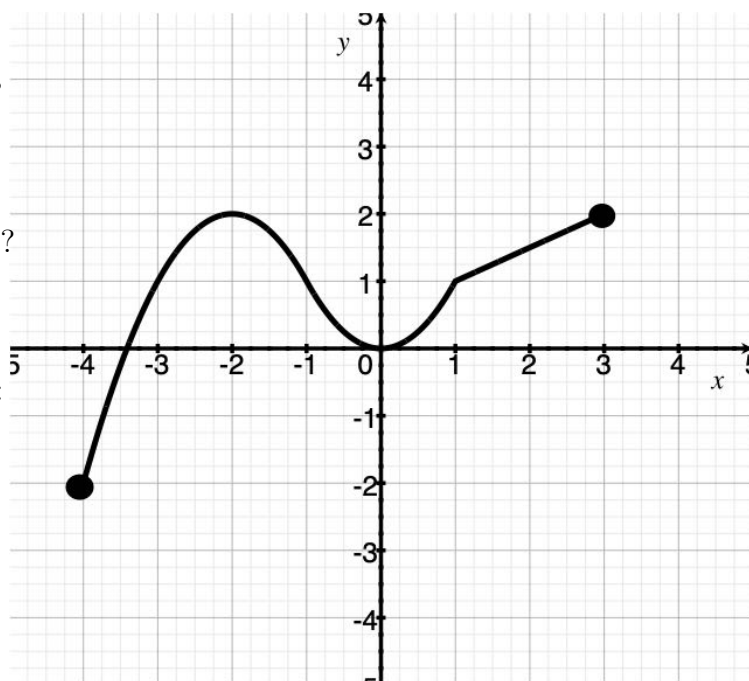
iii. [2] (WrittenHW§1.6 #68)
 $(f(f(-4)))$

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

v. [2] (PracticeExam1 #6) All possible x such that $f(x) = 1$.

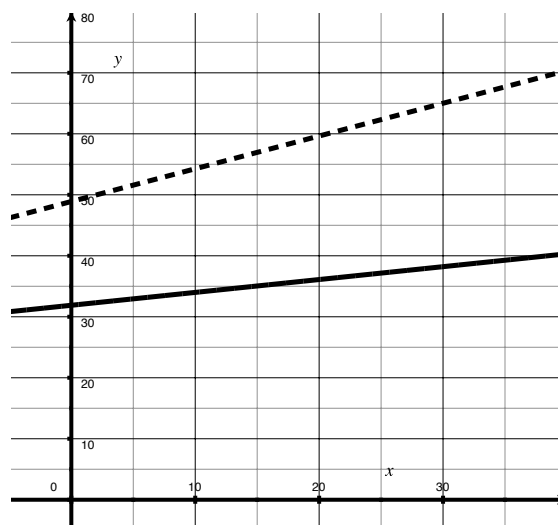
(d) [2] (InverseActivity#3) Does f have an inverse? Why or why not?

(e) [3] (WebHW1.5 #9) Graph $\frac{1}{2}f(x) + 3$.



4. (LineActivity #7) The functions below (approximately) return the median annual income (reported in thousands of dollars) of Americans since 1960 for Asian Americans (A) and Latinx Americans (L).

- (a) [2] Let x be the years since 1960, then $A(x) = .537x + 48.900$, and $L(x) = .211x + 31.886$. Identify which line is A and justify your choice.



- (b) [2] Which population's median annual income is increasing faster? Justify your answer.

- (c) [2] (WebHW7 #5) Given that A and L both have inverses, estimate $A^{-1}(60)$. Interpret your answer in terms of median annual income and year.

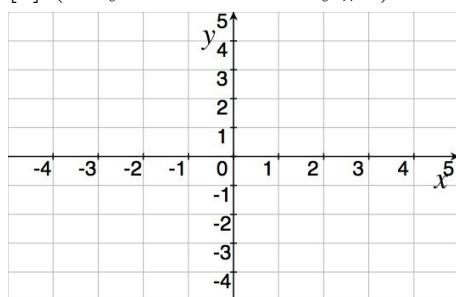
- (d) [3] (WrittenHW§1.7 #78) Find the algebraic rule/expression for $A^{-1}(x)$.

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

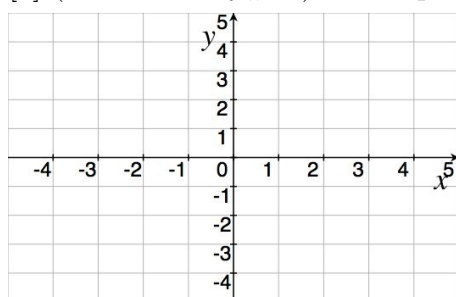
$$\frac{2}{x+2} = \frac{1}{x-2} + \frac{3}{5}$$

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

- (a) [4] (Polynomial Activity#4) A degree 4 polynomial that has $x - 1$ as a factor.



- (b) [4] (Line Activity#12) A line parallel to $y = \frac{1}{3}x + 2$ and through $(0, -3)$.



7. 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) (WordProblems #4) “*The Interview*” generated roughly \$15 million in online sales and rentals during the first 4 days of availability, Sony Pictures said on Sunday. Sony did not say how much of that total represented \$6 digital rentals verses \$15 sales” -New York Times Dec 28th 2014.

- i. [3] Write a rule/expression that returns the total sales as a function of digital rentals and sales.
- ii. [2] Given that “there were a total of 2 million transactions [digital rentals and sales] over all.” (also from New York Times), find how much of the total \$15 million was the result of the digital rentals and how much was from the \$15 sales.

- (b) (WebHW2.2) A farmer would like to fence land near a river so that the river will act as one of the sides of the pasture. The farmer has 200 meters of fencing that she can use.

- i. [3] Write a rule/expression that returns the area fenced in a rectangular pasture as a function of the width of the pasture.
- ii. [2] How wide and long should the pasture be to maximize the area enclosed?