

NAME:

1. [8] 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    $\frac{1}{x} + \frac{x}{y} = \frac{y+x}{xy}$

T   F    $x^2 + x^3 = x^5$

T   F    $(x+1)^2 = x^2 + 2x + 1$

T   F    $i^3 = -1$

T   F    $\log_2(16) = 4$

T   F    $\frac{1}{1 - \cos x} + \frac{1}{1 + \cos x} = 2 \csc^2 x$

T   F    $6x - 5$  divides  $18x^2 + 15x - 25$  with no remainder.

T   F   The vertex of  $(x-2)^2 - 5$  is  $(-2, -5)$

Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

2. [4] (Exam2 #2) Find any real or imaginary  $x$  such that  $6x^{-1} = 1 + 10x^{-2}$ .

3. (Exam2 #7) Let  $h$  be piece-wise defined by:

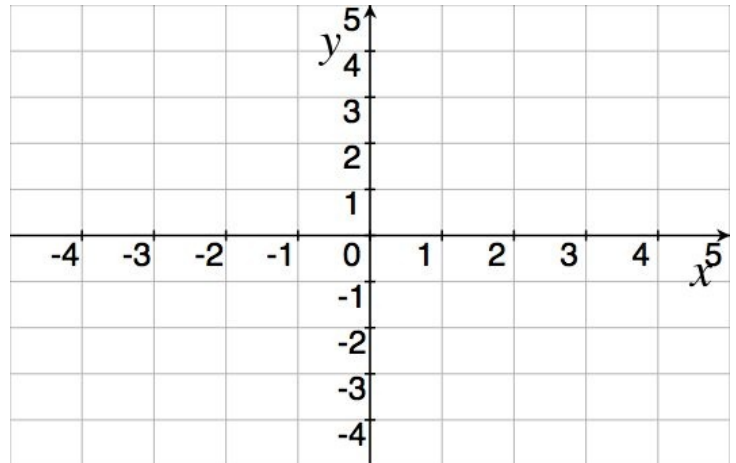
$$h(x) = \begin{cases} \frac{1}{4}x(x+3)^2 & x \leq 1 \\ \log_2 x & 1 < x \leq 4 \end{cases}$$

- (a) [1] (Quiz2 #3)

What is the domain of  $h$ ?

- (b) [2] (WebHW6 #9)

Find the real roots of  $h$



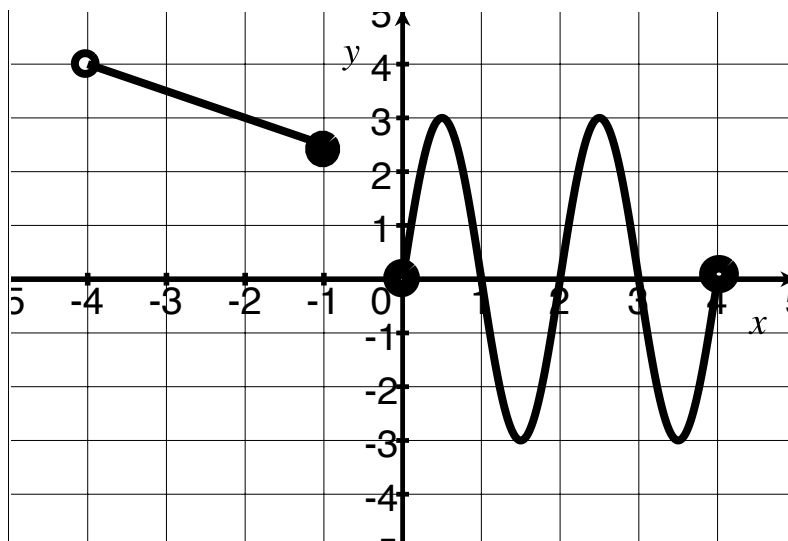
- (c) [4] (Exam2 #7) Sketch a graph  $h$

4. [3] (PracticeFinal #3) Let  $m(x) = \frac{x}{x+5}$ . Given  $m$  passes the horizontal line test, find  $m^{-1}$ .

5. (PracticeFinal #5)

Let the graph to the right be the complete graph of  $f$ .

(a) [1] (Quiz1#2) Find the range of  $f$ .



(b) [5] (WebHW12 #11 & LineWks #9)

The function  $f$  is a piecewise defined function consisting of a sinusoidal curve and a portion of a line. Find a formula for the function  $f$  in the indicated form:

$$f(x) = \begin{cases} & \text{if } -4 < x \leq -1 \\ & \text{if } 0 \leq x \leq 4 \end{cases}$$

(c) [5] (§1.3 #56) Estimate the following *if* possible:

$$2f(-3)$$

$$f(-3) - f(1)$$

$$f \circ f(-2)$$

(d) [2] (Quiz1 #2) Estimate the  $x$  value(s) so that  $f(x) = 3$ ?

(e) [3] (WebHW7 #22) Sketch the graph of  $f(x + 2) + 1$

6. [4] (PracticeExam2 #4 & §4.6 #27) Simplify

$$\frac{\sqrt[3]{x^2}(y^2)^{\frac{3}{2}}}{x^{\frac{2}{3}}y^2}$$

$$\arcsin\left(\sin \frac{4\pi}{3}\right)$$

7. Solve for  $x$  in the following:

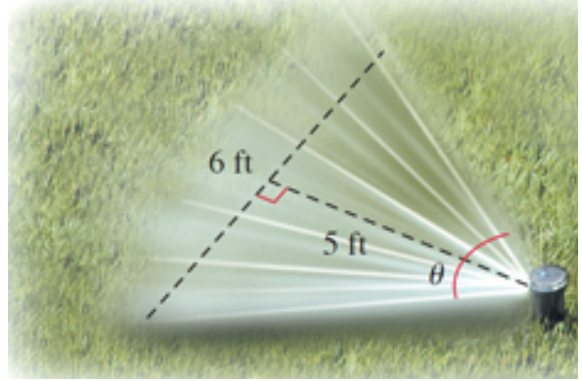
$$[4] \text{ (§3.4 \#68)}$$

$$\log_6(x+2) - \log_6(x-3) = 1$$

$$[3] \text{ (WebHW8 \#13)}$$

$$3 \cdot 2^{3x-2} + 4 = 15.$$

8. [3] (§4.6 #87) A sprinkler rotates back and forth through the angle  $\theta$  as shown to the right. At a distance of 5 feet from the sprinkler, the rays that form the sides of angle  $\theta$  are 6 feet apart. Find  $\theta$ .



9. Given that  $\sin \theta = \frac{-12}{13}$  and  $\pi < \theta < \frac{3\pi}{2}$ .

(a) [3] (§5.1 #7) Find  $\cos \theta$  *exactly*

(b) [5] (WebHW14 #23) Find  $\sin(2\theta)$  *exactly*

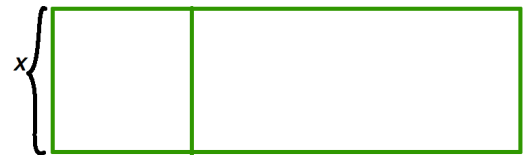
10. [5] Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want to be considered for credit.

No, doing both questions will not earn you extra credit.

- (a) (WordWks #6) You have \$5500 in a retirement fund. There are 5 year CDs (certificate of deposits) being offered with an annual rate of 2.03% and index funds (a collection of stocks from companies included in measures like the S&P 500) that returned 8.2% since the 1990's. You will invest all of your money in one of these two options.

- i. [3] Let  $x$  be the amount of money you invest in CD's. Find a function of  $x$  that represents the money earned in a
- ii. [2] How much money do you relegate to put in an index fund to get an annual

- (b) (Exam1 #7) A gardener wants to use 120 feet of fencing to enclose a rectangular garden and divide it into two plots, as shown in the figure to the right.



- i. [3] Find a function of  $x$  that represents the area of the garden.
- ii. [2] Algebraically determine the largest possible area for such a garden.

11. [5] 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) (WordProblemWks2 #3) You have four ten-year subsidized loans you took out to pay for college. Below is a table of the loans taken and their respective effective annual interest rates (AIR):

loan (\$)	8,000	9,000	10,000	12,000
AIR (%)	3.49	4.22	5.01	6.29

Assume all loans are continuously compounded once interest start accruing. You do not have a job lined up yet so you doubt you will be able to make any payments for the three years,

- i. [2] Assuming you defer your loans so that you don't have any additional fees beyond interest. What will the total balance you owe in three years without making any payments?
  - ii. [3] After graduation you are given the option of consolidating (that is take out one loan to pay off *all* the balances on your current loans). What rate would you need to consolidate your loans at to be in a better position three years from now?
- (b) A sound with intensity  $x$  has  $10 \log \frac{x}{I_0}$  decibels,  
 where  $I_0 = 10^{-12}$  watts per square meter ( $\text{W}/\text{m}^2$ ).
- i. [2] France passed a law limiting iPods and other MP3 players to a maximum possible volume of 100 decibels. Find the maximum intensity (in  $\text{W}/\text{m}^2$ ) an iPod is legally allowed to output in France.
  - ii. [3] Normal conversation has a sound level of about 65 decibels. How many more times intense than normal conversation is the sound an iPod operating at the French maximum of 100 decibels?

12. [5] 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) (§6.2 #63) A laser beam with an angle of elevation of  $42^\circ$  is reflected from a target and received 1200 yards from the point of origin (assuming the ground is horizontal). Assume the trajectory of the beam forms an isosceles triangle.
- [1] Draw a diagram of the situation described.
  - [2] Find the total distance that the beam travels.
  - [2] Find the height of the target.
- (b) (PracticeFinal #16) Points  $A$  and  $B$  are separated by a lake. To find the distance between them, a surveyor locates a point on land such that  $\angle CAB = 30^\circ$ . She also measures  $CA$  as 475ft and  $CB$  as 345ft.
- [2] Draw a picture of the situation. Do you have enough information to find the distance between  $A$  and  $B$ ? Justify yourself.
  - [3] If you can, find the distance between  $A$  and  $B$ . If you can't, what two distances are possible?