

Name:

Perm:

Math 34A Final Exam, Summer 2022

(100 pts total)

1. Use the log table provided with this exam to answer the following questions:

(a) Find $\log(3118)$

$$\log(3118) \approx$$

(b) Find $\log(5^{10})$

$$\log(5^{10}) \approx$$

(c) Approximate a solution for x in the equation

$$10^{x-5} = 5^{10}.$$

(You must use the log table to find a numerical answer.)

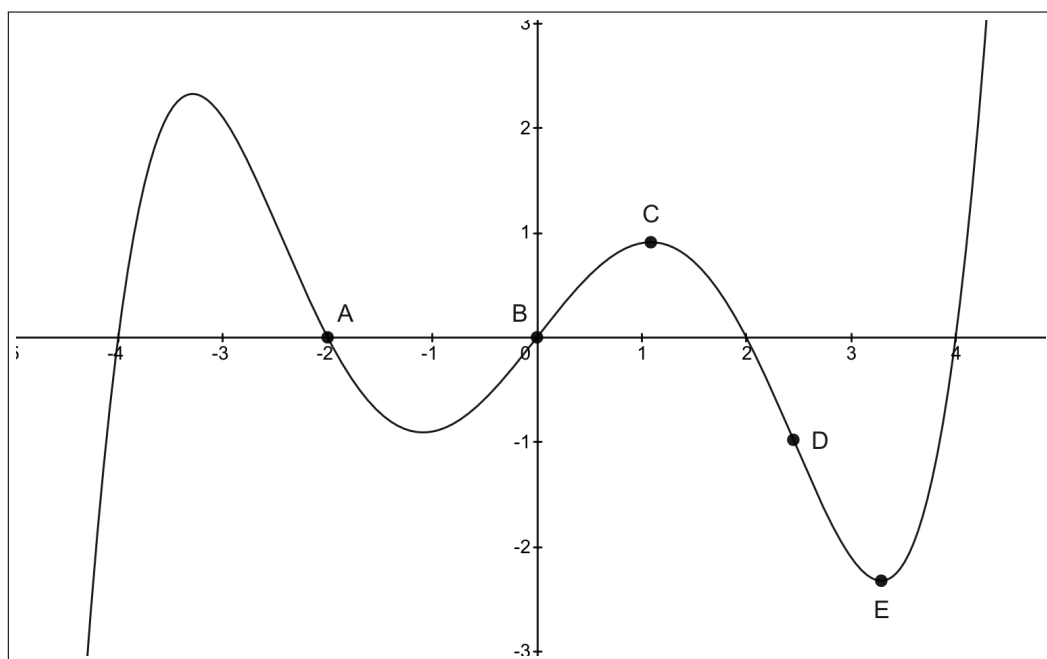
$$x \approx$$

2. (6 pts) Find $f'(x)$, where

$$f(x) = 2e^{3x} + 3x^2 + 2x + \pi.$$

$$f'(x) =$$

3. (9pts) Below is the graph of a function $g(x)$ with five labeled points, A , B , C , D , and E . Identify a point where $g''(x) < 0$, a point where $g''(x) = 0$, and a point where $g''(x) > 0$.



Be sure to only write **one** point in each box!

$$g''(x) < 0$$

$$g''(x) = 0$$

$$g''(x) > 0$$

4. (10 pts) A goblin catapult sits at the top of a cliff, overlooking the enemy. When it launches, the height of its “projectile” (see figure) is given by the equation

$$f(t) = -5t^2 + 20t + 25,$$

where t is the time in seconds since launch and $f(t)$ is the height (in meters) of the projectile above the enemy. (In this problem we are ignoring horizontal movement.)



- (a) How high is the cliff which the goblin is launched from?

meters

- (b) In your own words, interpret $f(1) = 40$, $f'(1) = 10$.

- (c) What is the goblin’s highest altitude?

meters

- (d) How long will we be able to hear the projectile cackling maniacally until it strikes the target?

seconds

- (e) As time goes by, is the goblin’s acceleration increasing, decreasing, or staying the same? Use calculus to justify your response.

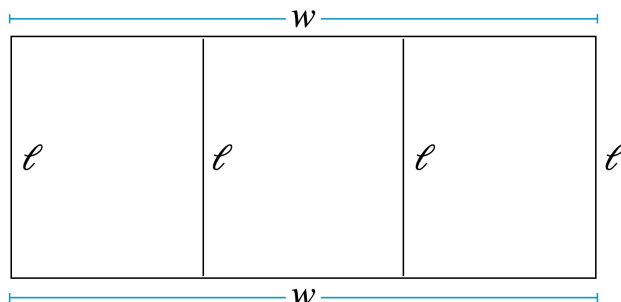
5. (10pts) For this problem, $f(x) = (x^2 + 4)(x + 3)$.

(a) $f'(x) =$

(b) $f''(x) =$

6. (6pts) You have 600m of fencing for a rectangular field, but the field needs to also be subdivided into 3 equal areas by fencing as shown in the figure to the right. If ℓ and w (length and width) are the dimensions of your pen, the total combined fencing must be 600m, so

$$4\ell + 2w = 600.$$



(a) Express the **area** of the pen in terms of ℓ only.

$A(\ell) =$

m^2

(b) Find the length that results in the largest area $A(\ell)$ for your field.

$\ell =$

m

(c) Use your answer in part (b) to find the maximum area for your field.

$A_{\max} =$

m^2

7. (15pts) Jack Johnson* will be playing at the Santa Barbara Bowl next fall. He gives you 100 concert tickets, asking you to sell them on campus for a charity and to give away any left-over tickets. The price is up to you, but you need to sell them all at the same price. If the price you set is \$20 each then you would sell all 100 tickets. For each dollar you decide to increase the price, the number of tickets you could sell would decrease by 2.

(a) If your ticket price is $\$x$, how many tickets would you be able to sell?

tickets

(b) What is the total revenue (in terms of x) you would receive for selling those tickets? You do not need to simplify your answer for this part.

\$

(c) What is the optimal ticket price, and how much money would you raise for charity altogether at that price?

price: \$

maximum revenue: \$

*Maybe this story isn't so far-fetched. Jack Johnson is a UCSB alumnus and after he heard about a tragic event that happened here a few years ago he came and played a free concert in front of Storke Tower. He also fund-raises frequently for people in need in this area, including a benefit a couple months ago for victims of the Thomas fire.