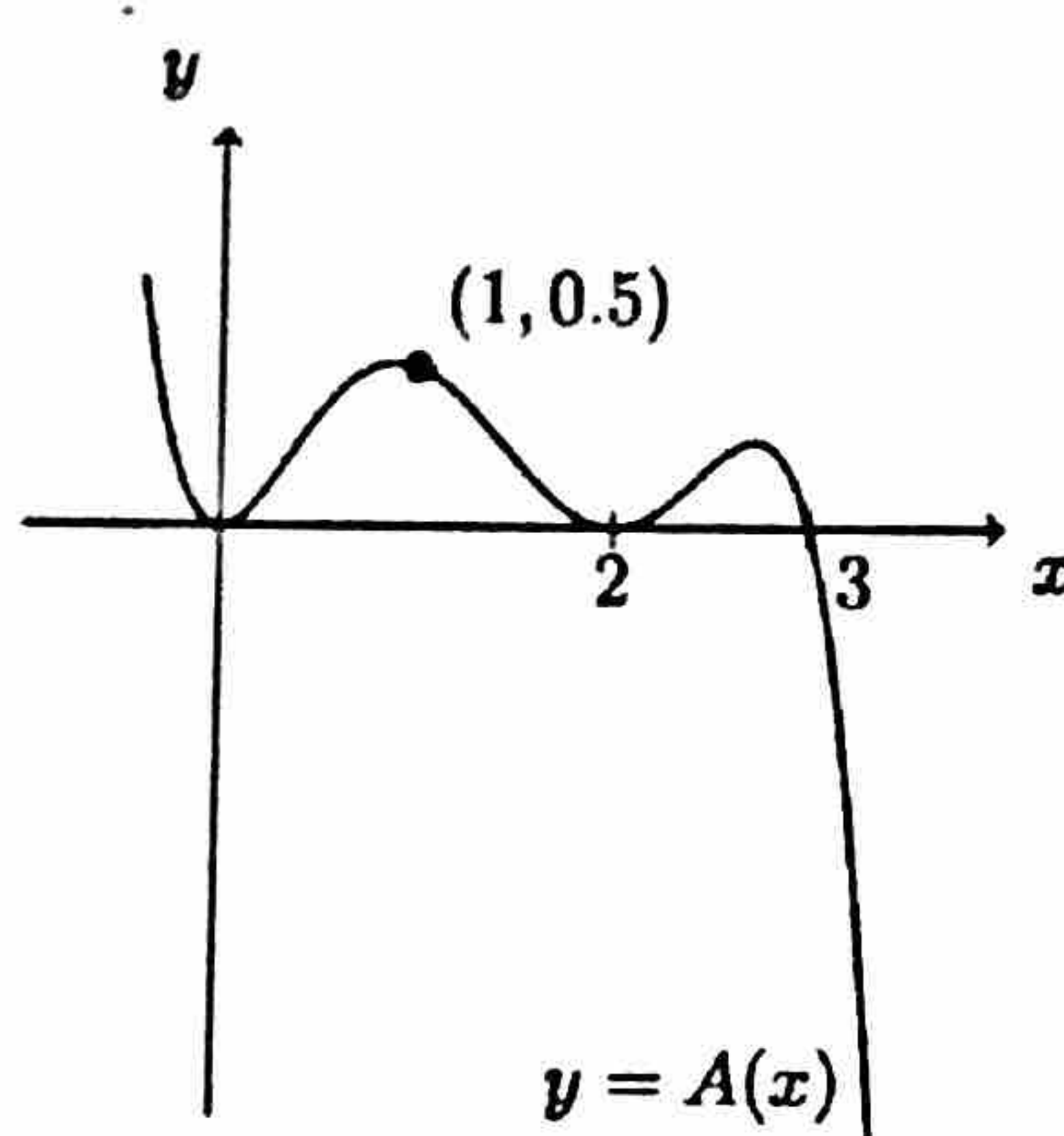


Math 105, Section 052 - Quiz 9  
Date: 4/12/18

Name: Donald Glover

Write legibly, show work and indicate your final answers. No books, notes, etc. are permitted. Calculators are allowed. This is double sided. Good luck!

1. (10 points) Consider the graph of  $y = A(x)$  given below:



odd degree polynomial  
( $y \rightarrow \infty$  for  $x \rightarrow -\infty$   
 $y \rightarrow -\infty$  for  $x \rightarrow \infty$ )

- (a) (2 points)  $A(x)$  is a degree 5 polynomial. Write down all of its zeros.

$A(x)$  has zeros at  $x = \underline{0, 2, 3}$

- (b) (3 points) Write down a formula for  $A(x)$ , showing all your work.

$$A(x) = K(x-0)^2(x-2)^2(x-3)$$

$$A(1) = 0.5 = K(1)^2(1-2)^2(1-3)^2 = K(1)(-1)^2(-2)$$

$$0.5 = K(-2) \Rightarrow K = -\frac{1}{4}$$

$$A(x) = \underline{-\frac{1}{4}(x)^2(x-2)^2(x-3)}$$

- (c) (5 points) Suppose we have the following values of  $N$  and  $t$ .

$t$	4	6
$N$	100	1000

Suppose  $N = h(t)$  where  $h(t)$  is a power function. Find a formula for  $h(t)$ , leaving your answer in **exact form** and showing all your work.

$$h(t) = Kt^p$$

$$\frac{h(6)}{h(4)} = \frac{1000}{100} = \frac{K6^p}{K4^p} = \left(\frac{6}{4}\right)^p \rightarrow \left(\frac{6}{4}\right)^p = 10$$

$$p \log\left(\frac{6}{4}\right) = \log(10)$$

$$p = 1/\log\left(\frac{3}{2}\right)$$

$$h(t) = \underline{100 \cdot 4^{-1/\log(3/2)} t^{1/\log(3/2)}}$$

$$h(4) = 100 = K 4^{1/\log(3/2)}$$

$$\Rightarrow K = \frac{100}{4^{1/\log(3/2)}}$$



2. (10 points) Word of Chuck and Samsa's heroics spread far and wide. Residents of Chickenville realized that the giant cockroaches were actually very amiable creatures, and began to keep them as pets. In Chickenville,  $t$  months after February 1,

- The total number of chickens is  $P(t)$ .
- The total number of pet cockroaches is  $C(t)$ .
- The total number of wild cockroaches is  $W(t)$ .

Assume that all of these functions are increasing, and assume all cockroaches are either wild or pets. Write mathematical expressions for the following quantities, including relevant units

*Hint: You will have to write these expressions in terms of the functions given. Not all of the functions are needed for each part. You may also assume that these functions are invertible and that you can maybe write some of these expressions using the inverse of the given functions.*

(a) (2 points) The fraction of cockroaches that are kept as pets  $t$  months after February 1.

$$\frac{C(t)}{C(t) + W(t)}$$

(b) (2 points) The average rate of change for the total number of cockroaches between April 1 and June 1.

$$\frac{C(4) + W(4) - (C(2) + W(2))}{4 - 2}$$

(c) (2 points) The number of months it takes for the number of pet cockroaches to increase from 62 to 130.

$$C^{-1}(130) - C^{-1}(62)$$

(d) (2 points) The number of years it takes, after February 1, for the number of wild cockroaches to increase to 205.

$$\frac{W^{-1}(205)}{12}$$

(e) (2 points) Write a practical interpretation of the quantity  $P(C^{-1}(327))$

The # of chickens there are in Chickenville when there are 327 pet cockroaches