Math 242 Exam 1 February 4th, 2019

Name and UH ID: _____

Section Number: _____

Show all work clearly.

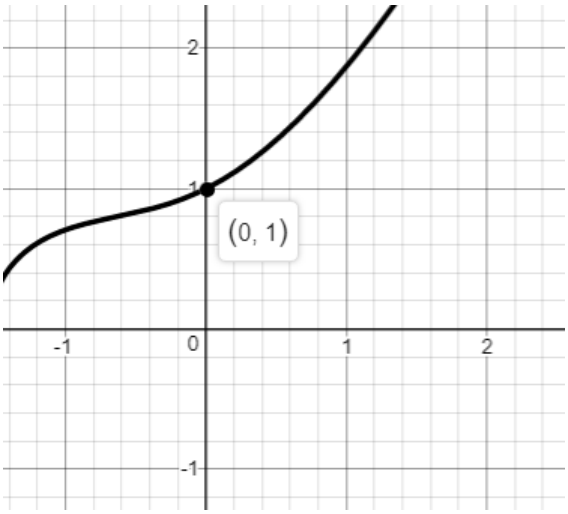
Answer the questions in the spaces provided on the question sheets.

If you run out of room for an answer, use the blank sheet at the end of the exam. Clearly label your work.

No calculators or notes allowed.

Question	Points	Score
1	10	
2	35	
3	10	
4	20	
5	25	
Total	100	

1. (10 points) Given the following graph of the function $f(x)$, answer the following questions:



Note that the only labeled point is (0,1)

(a) (5 points) Sketch on the same coordinate plane the graph of the function $f^{-1}(x)$.

(b) (5 points) Suppose that $f'(0) = \frac{1}{2}$. Pick a point on the graph of $f^{-1}(x)$, and determine the slope of the tangent line through that point. Justify your work.

2. (35 points) Differentiate the following functions.

   (a) (10 points) $g(r) = \sec(e^{\sqrt{r}})$

   (b) (10 points) $y = \log_2(x^2 - 4)$

(c) (15 points) $h(x) = x^{\ln(x)}$

3. (10 points) Due to environmental changes, the population of a certain species of ant is decreasing at a rate proportional to its size. If the relative decay rate is 10%, in how many years will the population be half of it's current value? Leave your answer unsimplified.

4. (20 points) Evaluate the following limits. Remember to use proper notation, and to indicate if you are using L'Hospital's Rule.

   (a) (10 points) $\lim_{x \to 0} \dfrac{\sin x - x}{x^3}$

   (b) (10 points) $\lim_{x \to \infty} \arccos\left(\dfrac{x^3 - 2}{x^3 + 1}\right)$

5. (20 points) Evaluate the following integrals.

   (a) (13 points)

$$\int x^2 \sin x \; dx$$

(b) (12 points)

$$\int_0^{\ln 2} \frac{e^x}{1+e^x}\, dx$$

BLANK SHEET FOR EXTRA WRITING

Formula Sheet

- Inverse Trigonometric Derivatives
  - $\frac{d}{dx}\sin^{-1}(x) = \dfrac{1}{\sqrt{1-x^2}}$
  - $\frac{d}{dx}\cos^{-1}(x) = -\dfrac{1}{\sqrt{1-x^2}}$
  - $\frac{d}{dx}\tan^{-1}(x) = \dfrac{1}{1+x^2}$
  - $\frac{d}{dx}\cot^{-1}(x) = -\dfrac{1}{1+x^2}$
  - $\frac{d}{dx}\sec^{-1}(x) = \dfrac{1}{x\sqrt{x^2-1}}$
  - $\frac{d}{dx}\csc^{-1}(x) = -\dfrac{1}{x\sqrt{x^2-1}}$
- Common Integral
  - $\int \tan x \; dx = \ln|\sec x| + C$