

Instructions: Read the entire statement of each problem. Solve each problem carefully and organize your work. Be sure to include units and write your answers in complete sentences where appropriate. The exam is worth 100 points.

1. (20 Points) Let $f(x) = 3x - 1$ and $g(x) = -x^2 + 1$. Compute the following. Simplify when possible.

(a) $f(-2)$.

(b) $[f(x)]^2 + 4g(x)$.

(c) $f(g(x))$.

(d) $\frac{f(x+h) - f(x)}{h}$.

2. (10 Points) A rectangular farm is 4 times longer than it is wide. The farm will be fenced in with material that costs \$8 per foot. Write a function that gives the cost of fencing in the farm as a function of its width.

3. (10 Points) Find an equation for the line parallel to $2x - 5y = 6$ through the point $(4, -1)$.

4. A local baker specializes in artisanal bread. Their bakery has a fixed cost of \$500 per month. It costs \$1.50 to produce each loaf of bread, and they sell the loaves for \$4 each.

(a) (6 Points) Write a function that gives the company's monthly cost in terms of number of loaves produced. What is the cost if they produce 200 loaves that month?

(b) (9 Points) How many loaves do they have to produce and sell to make a **profit** of \$2,500 dollars?

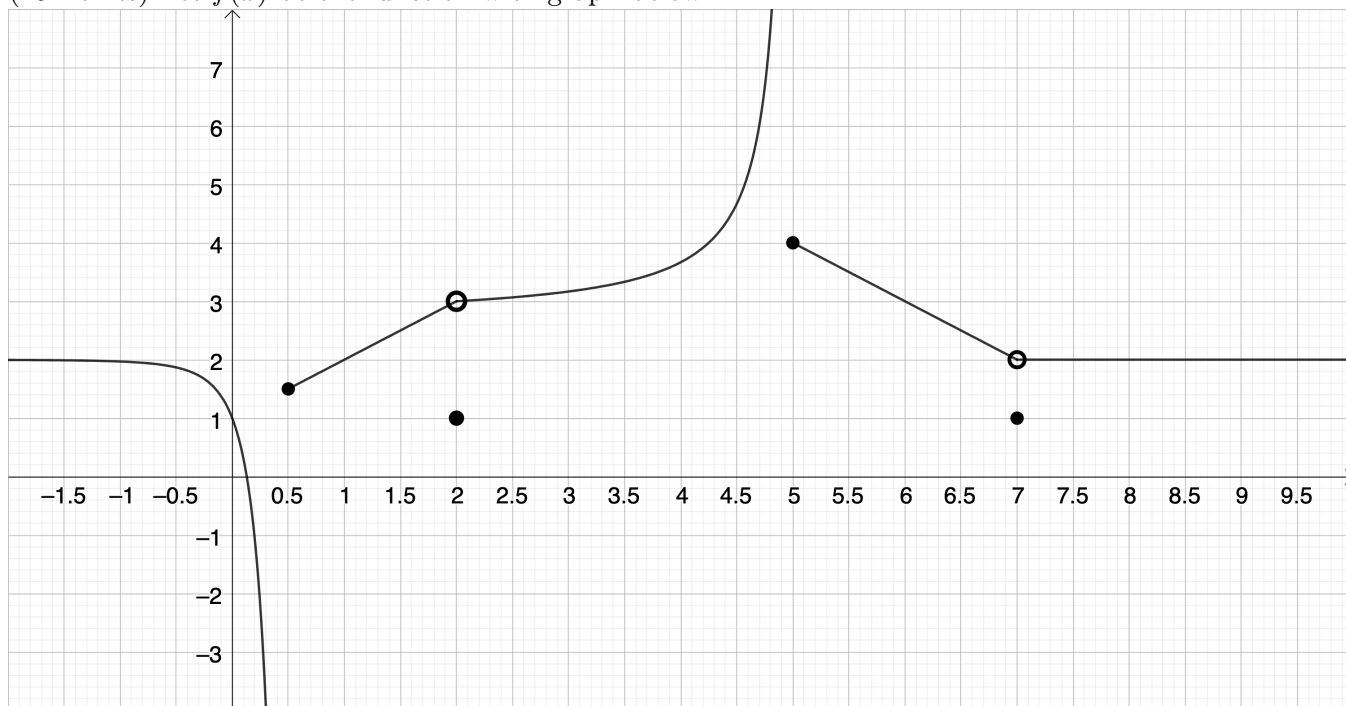
5. A population of fish (in hundreds) in a certain pond t years after 2010 is given by the function $P(t) = t^2 - 14t + 64$.

(a) (4 Points) How many fish are in the pond in 2010?

(b) (6 Points) When will there be 1,500 fish in the pond?

(c) (5 Points) Compute the average rate of change in the fish population from 2012 to 2018.

6. (15 Points) Let $f(x)$ be the function with graph below:



Compute the following, if they exist.

(i) $f(5)$

(iv) $\lim_{x \rightarrow 2} f(x)$

(ii) $\lim_{x \rightarrow 5^+} f(x)$

(v) $\lim_{x \rightarrow 6} f(x)$

(iii) $\lim_{x \rightarrow 0.5} f(x)$

(vii) $\lim_{x \rightarrow -\infty} f(x)$

(viii) At which values of x is $f(x)$ discontinuous?

7. (15 Points) Compute the following limits algebraically (if they exist).

(a) $\lim_{x \rightarrow 3} \frac{5x^3 + 7x^2 - 4}{x - 1}$

(b) $\lim_{x \rightarrow 5} \frac{x^2 - 3x - 10}{x - 5}$

(c) $\lim_{x \rightarrow \infty} \frac{4x^4 - 6x - 1}{8x^4 + 3x^3 + 21}$