

Exam 1 covers sec 1.1-1.4, 9.1-9.3, 10.1-10.3. This includes all material covered in class, homework, online homework, and quizzes.

1. Find the natural domain of the following functions. Give your answer in interval notation.

a) $f(x) = \frac{3x+2}{x^2-4x-5}$

b) $g(x) = \sqrt{2-x}$

2. Evaluate the following expressions if possible given $f(x) = x^2 - 3$ with domain $(-1,5]$

a) $f(-1)$

b) $f(1)$

c) $f(5)$

d) $f(6)$

3. Evaluate the following expressions using the function below.

x	-1	0	1	2	3
$f(x)$	5	3	0	-2	-3

a) $f(3) - f(0)$

b) $4f(2)$

4. Given $f(x) = \begin{cases} -x^2 + 2 & \text{if } x \leq 1 \\ x + 1 & \text{if } 1 < x \leq 3 \\ 4 & \text{if } x > 3 \end{cases}$

a) Sketch the graph

b) Evaluate the following limits algebraically

i)
 $\lim_{x \rightarrow 0} f(x)$

ii)
 $\lim_{x \rightarrow 1^-} f(x)$

iii)

$$\lim_{x \rightarrow 1^+} f(x)$$

iv)

$$\lim_{x \rightarrow 1} f(x)$$

c) Find all points of discontinuity. At each discontinuity, is there a value that can be assigned to make the function cont? If so, give the value. If not, explain why.

5. Write the equations for the functions

x	-2	-1	0	1	2
$f(x)$	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9
$g(x)$	5	2	-1	-4	-7

6. Write the equation and sketch the graph of the line described below

a) passing through (-2,3) and (4,1)

b) passing through (-4,3) and (-4,-2)

c) parallel to $y = 2x - \frac{4}{5}$ and passing through (0,5)

7. The store you work at is able to sell 300 chairs each week when charging \$20 and can sell 900 chairs each week when charging \$10. However, the manufacturer will supply you with 200 chairs each week if they are being sold for \$10 and will supply you with 1000 each week if they are sold for \$20. If linear,

a) Write the supply function.

b) Write the demand function.

c) Find the equilibrium price and the number of chairs that would be sold at that price.

d) Sketch a graph showing the supply and the demand function. Identify areas of surplus, shortage, and equilibrium.

8. Given $f(x) = -x^2 + x + 2$. Find

a) opening up or down

b) vertex

c) all intercepts

d) symmetry

e) sketch the graph

9. The demand for pencils is $q = -400x + 1200$ where q is the number of pencils and x is the price per pencil. The manufacturer has fixed costs of \$20 plus \$0.50 per pencil.
- Write the cost as a function of x .
 - Write the revenue as a function of x .
 - Write the profit as a function of x .
 - Determine the price per pencil that should be charged to maximize profit? What is the max profit?
 - Sketch a graph showing the cost and revenue functions. Identify locations of loss, breakeven, and profit.
10. Find the exponential function passing through (1,5) and (3,45).
11. If you invest \$1000, will you have more money after 5 years if it is invested at 8% compound annually or if it is invested at 7% compounded continuously?
12. Find the half-life (to the nearest year) of strontium-90 given the exponential decay model $Q(t) = Q_0 e^{-(0.025)t}$

13. Estimate the limit numerically

a)

$$\lim_{x \rightarrow 1} \frac{x}{x-1}$$

b)

$$\lim_{x \rightarrow \infty} \frac{x}{x-1}$$

14. Draw a function that is not continuous, but is continuous on its domain.

15. Draw a function that is not continuous and is not continuous on its domain.

16. Evaluate the limit algebraically

a)

$$\lim_{x \rightarrow 0} \frac{x^2 + 4}{x - 3}$$

b)

$$\lim_{x \rightarrow -1} \frac{x^2 + 4x + 3}{x^2 - 5x - 6}$$

c)

$$\lim_{x \rightarrow -3^+} \frac{4}{x^2 + 3x}$$

d) Give the equation of the horizontal asymptote of $f(x) = \frac{5x^4 - 3x^2 + 6x - 9}{x^5 + x - 4}$