Practice Exam I

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Identify the slope and intercepts of $2x-6y =18$.
   A) $m=1/3$, x-intercept = 9, y-intercept = -3
   B) $m=1/3$, x-intercept = -3, y-intercept = 9
   C) $m=3$, x-intercept = 9, y-intercept = -3
   D) $m=3$, x-intercept = -3, y-intercept = 9
   E) none of these

2) Which of the following correspondences defines a function?
   A) The pairing of a person's height with a student in our class.
   B) The pairing of a student in our class with their advisor.
   C) The pairing of a baseball team and who plays first base?
   D) The pairing of a player on the baseball team and his batting average.
   E) The pairing of a student in our class and their phone number.

3) Find the parabola which passes through the point (6, 4), which opens up, and has a vertex at (9,-2). It has a y-intercept at:
   A) 10
   B) 25
   C) 52
   D) 27
   E) none of these

4) Given the function $f(x) = \frac{x+2}{x}$, find the difference quotient.
   A) -2
   B) $-\frac{2}{x(x+h)}$
   C) +2
   D) $\frac{2}{x(x+h)}$
   E) none of these

5) Explain how the graph of $y = - \frac{4}{x} -3 +1$ is related to the graph of $y = |x|$
   Check all that apply.
   A) Stretched by a factor of 4.
   B) Reflected about the x-axis.
   C) Shifted up one.
   D) Shifted left three.
   E) Shifted right three.

6) Write the equation of the line through the points (-3,-2) and (7,2). Write your answer in standard form.
   A) $2x-5y = 4$
   B) $3x+4y = -1$
   C) $4x-3y = -6$
   D) $x-5y = 7$
   E) none of these
7) Given \( f(x) = 0.25x^2 + 3x + 10 \). Write the function in vertex form.

A) \( f(x) = \frac{1}{4}(x - 2)^2 - 5 \)
B) \( f(x) = 0.25(x - 4)^2 + 3 \)
C) \( f(x) = \frac{1}{4}(x + 6)^2 + 1 \)
D) \( f(x) = 0.25(x - 2)^2 + 7 \)
E) none of these

7) C

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

8) Puppy Palace has operating costs of \( 25x - 55 \), where \( x \) represents the number of puppies sold each month in tens. They have a price-demand function of \( p = -5x + 75 \). How many puppies do they need to sell each month to break even?

8) 110 pups

9) Farmer Jones wants to build a small rectangular corral using his barn as one side. If he has available 120 ft of fencing for the other three sides, what dimensions will maximize the area?

9) 30’x60’

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

10) A quadratic function can have how many intercepts?

A) 2 x-intercepts; 1 y-intercepts
B) 2 x-intercepts; 2 y-intercepts
C) 1, or 2 x-intercepts; 1 y-intercepts
D) 0, 1, or 2 x-intercepts; 1 y-intercepts
E) none of these

10) D

11) Given a fifth degree polynomial with a negative leading coefficient, as \( x \to \infty \), the y value approaches

A) \( \infty \)
B) \(-\infty \)
C) 0
D) not enough information provided to determine

11) B

12) Find the inverse of \( f(x) = \frac{x + 1}{x - 5} \)

A) \( f^{-1}(x) = \frac{x - 5}{x + 1} \)
B) \( f^{-1}(x) = \frac{1 - 5x}{x + 1} \)
C) \( f^{-1}(x) = \frac{5x + 1}{x - 1} \)
D) \( f^{-1}(x) = \frac{5 - x}{x - 1} \)

12) C
13) Which of the following functions are not 1-1?  
A) \( f(x) = e^{x^2} \)  
B) \( g(x) = \log_5 (x+1) \)  
C) \( h(x) = \sqrt{4 - 2x} \)  
D) \( F(x) = |x - 5| \), for \( x > 0 \)  
E) all are 1-1

13) D

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.
14) \( \frac{0}{0} = 0 \)  
14) F

15) There exists an exponential function that has both a vertical and horizontal asymptote.  
15) F

16) \( \log_3 x^2 = 2 \log_3 x \)  
16) F

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.
17) Find the domain of the function \( f(x) = \frac{12 - 3x}{\sqrt{x + 5}} \)  
17) \( x > -5 \)

18) Solve: \( \log_b 9 = 2 \)  
18) \( b = 3 \)

19) Find the asymptotes of \( P(x) = \frac{(2x - 4)(x^2 + 6x + 5)}{(x^2 - 9)(x + 5)} \)  
19) HA: \( y = 2 \)  
   VA: \( x = 3, -3 \)

20) Find the exact solutions of \( e^{3x} = e^{x^2 + 2} \)  
20) \( x = 1, 2 \)
21) Solve: $x = \log_{0.5} 3.89$, rounded to 4 decimal places.  
21) $x = -1.9598$

22) Given the function $f(x) = \frac{2x^2 - 7x - 4}{x + 3}$, find the intercepts and asymptotes.  
22) intercepts 
$(0, -\frac{4}{3})$, $(\frac{1}{2}, 0)$, $(4, 0)$ 
asymptotes 
HA: none; VA: $x = -3$

23) Simplify: $\frac{e^{4x+1}}{e^{x+2}}$  
23) $e^{6x-5}$

24) Simplify: $(2e^{5-4x})^3$  
24) $8e^{15-12x}$

25) Solve: $x^2e^x - 4xe^x = 0$  
25) $x = 0, x = 4$

26) Given: $\log_b 2 = 4.5$, and $\log_b 3 = -2.4$, find $\log_b 18$  
26) $\log_b 18 = -0.3$

27) What are the domain and range of $y = 1 + \ln(x-5)$  
27) domain: $x > 5$  
range: $\mathbb{R}$

28) Given the demand function $p = D(x) = 5x^2 - 20x + 32$, and the supply function $p = S(x) = -2x^2 + 12x + 7$ for the interval from $[0,2]$ where $x$ is hundreds of units, find the equilibrium point.  
28) $(1, 17)$
29) Solve: \( \log 3 x^2 = 2 + \log 9x \)

30) Solve for \( y \) and write your answer in the form \( y = a \cdot e^c \)

\[ \ln y = -4t + \ln 5 \]

31) The total cost (in hundreds of dollars) to produce \( x \) ounces of perfume is given by the function \( C(x) = 3 x^3 - 48 x^2 + 204 x - 50 \) for \( 0.5 < x < 20 \).
   a. Find the average cost to produce 12 ounces.
   b. Approximate the minimum average cost.

32) Solve: \( 9^{2x-1} = 27^{x+3} \)

33) Solve: \( \log_4 49 = 2 \)

34) How long will it take for an investment to triple if invested at \( 8 \frac{1}{2} \% \) compounded continuously?

35) How long will it take for an investment of $5,000 to grow to $8500, if invested at \( 6 \frac{1}{4} \% \) compounded weekly?