

MATH 120
EXAM #1

Name _____

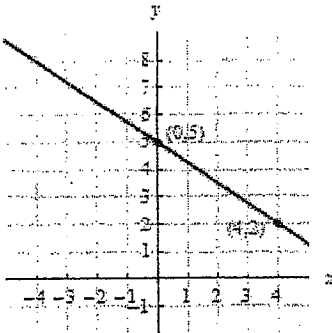
ALL PROBLEMS ARE WORTH 3 POINTS UNLESS OTHERWISE INDICATED. YOU MUST SHOW WORK (WHERE APPROPRIATE) TO RECEIVE CREDIT

1. Identify the slope and y-intercept of the line $y = 4$

Slope:

Y-intercept: (,)

2. Refer to the line below. Write the equation of the line that is parallel to the line below and passes through the point $(0, 4)$.



3. It costs \$112 to make a pair of snow skis. There are also fixed costs of \$6,800 per production period. If the skis sell for \$356, what is the linear profit equation?

P =

4. Write the equation of the secant line to the function $f(x) = 6x^2 - 4x$ through the points $(1, f(1))$ and $(2, f(2))$

5. The demand equation for a particular commodity sold at a price of P dollars per item is $D = 780 - 20P$ and the supply line for the same commodity is $S = 50P + 290$. Find the market price (also known as equilibrium price).

6. Cashews cost \$9 per pound and Walnuts cost \$5 per pound. If someone was to create a 100 pound mixture of the two types of nuts that costs \$6.10 per pound, how many pounds of each type of nut should go into the mix? **If you choose to solve using matrices, you must write out both matrices (original and solution matrix)**

_____ pounds of cashews

_____ pounds of walnuts

7. Solve the system of equations. **If you use matrices, you must write out the original matrix and the solution matrix.**

$$\begin{cases} x + y - z = 6 \\ 3x - 2y + z = -5 \\ x + 3y - 2z = 14 \end{cases}$$

x: _____

y: _____

z: _____

8. Approximately how many years will it take to triple an investment in an account paying 9% quarterly? Show your work to receive credit.

9. What would be the monthly payment on a \$21,000 loan if the interest rate is 6% and the loan is to be paid off in 4 years? Show your work to receive credit

10. How much money should you be investing semiannually into an annuity (retirement account) paying 5% if you'd like to have \$1,000,000 in 30 years?

11. Write the function obtained by taking the graph of $f(x) = \sqrt{x}$ and shifting it to the right 6 and down 3.

$f(x) =$

12. Consider the piecewise function $f(x) = \begin{cases} x^3 - 4 & \text{if } -2 \leq x \leq 3 \\ \sqrt{x-2} + 1 & \text{if } x > 3 \end{cases}$

A. State the domain of the function using set builder OR interval notation. _____

B. Fill in the blanks with the appropriate answer: $f(-1) =$ _____ $f(18) =$ _____

13. Consider the following function $f(x) = \frac{3x-12}{x+1}$ and answer the questions below.

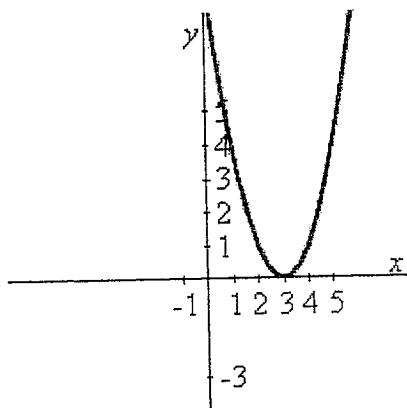
A. Find the x and y intercepts of the function

x =	y =
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B. Which of the following is the domain of the function?

- | | | | |
|------------------------------------|--------------------------------------|--------------------------------------|----------------------------------|
| a. $(-4, \infty)$ | b. $(4, \infty)$ | c. $(-\infty, -4) \cup (-4, \infty)$ | d. $(-\infty, \infty)$ |
| e. $(-\infty, 4) \cup (4, \infty)$ | f. $(-\infty, -1) \cup (-1, \infty)$ | g. $(-\infty, 1) \cup (1, \infty)$ | h. $(-\infty, -4) \cup (-4, -1)$ |

14. Consider the graph and determine which of the choices correctly identifies the function pictured in the graph



- | | | |
|------------------------|-------------------------|-----------------------|
| a. $f(x) = x^2 - 3$ | b. $f(x) = x-3 $ | c. $f(x) = x^2 + 3$ |
| d. $f(x) = (x^2 - 3)$ | e. $f(x) = (x-3)^2$ | f. $f(x) = (x+3)^2$ |
| g. $f(x) = \sqrt{x-3}$ | h. $f(x) = (x-3)^2 + 3$ | i. $f(x) = (x)^2 - 3$ |

B. State the interval of x over which the function is decreasing.

C. State the range of the function using interval notation.

MATH 120

Exam #2

1. The number of company bankruptcies filed between the years 1990 and 1999 can be modeled using the function $B(x) = 2.8x^2 - 22.4x + 117.8$ where $x = 0$ represents 1990, $x = 1$ is 1991, and so on.

(a) In what year was the number of bankruptcies the lowest?

(b) What was the lowest number of bankruptcies filed during the time period 1990-1999?

(c) By answering parts A and B above, what is it that you calculated?

- a. the x-intercepts b. the asymptotes c. the vertex d. the domain

2. The daily profit for selling x items is $P(x) = -x^2 + 10x - 24$.

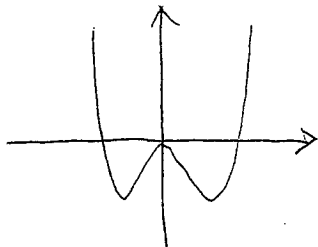
(a) Determine the x intercepts of the function.

(b) Which of the following best identifies what you just found in part A?

- i. The number of items that must be sold for Profit to be maximized
- ii. The number of items that must be sold for Revenue to be maximized
- iii. The number of items that must be sold for Supply and Demand to be equal
- iv. The number of items that must be sold for Cost and Revenue to be equal
- v. The number of items that must be sold for Profit to be decreasing

(c) Over what interval of x is profit decreasing?

3. Refer to the graph of the polynomial function below. Considering the end behavior of the function, which of the following functions could be pictures in the graph?



a. $f(x) = x^5 - 2x^3$

d. $f(x) = -x^4 - 2x^3$

b. $f(x) = 3x^{\frac{1}{3}} - x^3$

e. $f(x) = 3x^4 - 2x^3$

c. $f(x) = -x^5 - 2x^2$

f. $f(x) = x^{\sqrt{2}} - 2x^3$

4. Consider the function $f(x) = \frac{5x^2 - 10x}{x^2 + x - 6}$

(a) At what x-value does the function have a hole?

(b) What is the equation of the vertical asymptote?

(c) Find the equation of the horizontal asymptote by evaluating $\lim_{x \rightarrow \infty}$

(d) Evaluate the limit: $\lim_{x \rightarrow 2} f(x)$

5. Given the exponential function $g(x) = -2^x - 6$, state the range of the function. Also state the equation of the horizontal asymptote and the y-intercept.

Range:

Horizontal Asymptote:

y-intercept:

6. Given the exponential function $g(x) = 16^{-x} - 4$

(a) Find the x-intercept

(b) Find the limit $\lim_{x \rightarrow -1}$

7. The number of circuit boards, N , that an employee can assemble after t days of training is $N = 40 - 40e^{kt}$. If after 15 days of training, an employee can assemble 33 boards, calculate the value of the constant k and round your answer to 3 decimal places.

8. Consider the function $f(x) = \log_8(x + 8)$ and answer the questions below.

(a) What is the value of the y-intercept?

(b) At what x value does $f(x) = 2$?

(c) State the domain of the function.

9. How long will it take to turn \$10,000 into \$12,000 if invested at 6% compounded continuously?

10. Consider the piecewise function below and use it to answer the questions involving

$$\text{limits. } f(x) = \begin{cases} e^x - 2 & x \leq 0 \\ 4x + 3 & x > 0 \end{cases}$$

(a) Evaluate $\lim_{x \rightarrow 0^-}$ if it exists.

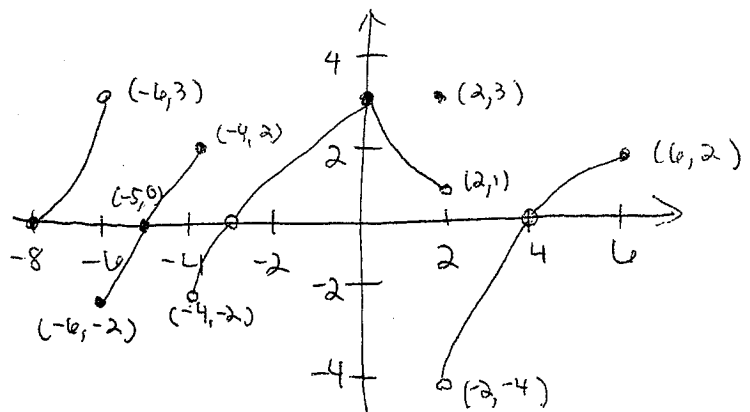
(b) Evaluate $\lim_{x \rightarrow 2}$ if it exists.

11. Use the graph to evaluate the limits. If the limit does not exist, you can simply write "DNE".

(a) Evaluate $\lim_{x \rightarrow -6^-}$ if it exists.

(b) Evaluate $\lim_{x \rightarrow -5}$ if it exists.

(c) Evaluate $\lim_{x \rightarrow 2}$ if it exists.



12. Below is the outcome of the difference quotient for a function. Use the result provided to find the derivative of the function by evaluating $\lim_{h \rightarrow 0}$ for the difference quotient below:

$$\frac{2xh + h^2 + 6h}{h}$$

13. The derivative of the function $g(x) = 4x^3 - 8x$ is $g'(x) = 12x^2 - 8$. Use the information to write the equation of the tangent line to the function $g(x)$ at $x = 1$. The answer should be in slope-intercept form $y = mx + b$.

MATH 120
EXAM #3

Instructor Name: _____
Time of Class: _____

Name _____

1. Given the function $f(x) = 2x^3 - 4x^2 - 10$, write the equation of the tangent line at $x = 2$.

2. Find the derivative of $f(x) = \frac{2x^2 - 1}{x - 3}$ at $x = 4$. You must show your work to receive any credit

3. Given the demand function $D(p) = \sqrt{85 - 4p}$, find the rate of change in demand when $p = 15$.
You must show work to receive credit.

3b. (2 points) What does this suggest about the behavior of demand when $p = 15$?

- a. Demand is decreasing b. Demand is increasing c. Demand is maximized

4. For the given function, find the x values at which horizontal and vertical tangents exist $f(x) = 3x^{2/3} - 3x$

Horizontal tangent at x = _____

Vertical tangent at x = _____

5. Given the function $f(x) = 3xe^{2x}$, find any x values at which the derivative is zero. You must show your work to receive any credit.

6. Find the derivative of the function $f(x) = 8\ln(x^2) - 3x$. Simplify your answer as much as possible. You must show your work to receive any credit.

6b. (2 pts) Based on part A, which of the following can you conclude about the function's behavior when $x = 8$?

- a. The function is increasing at $x = 8$ b. The function is decreasing at $x = 8$
c. The function has a local max or min at $x = 8$

7. The equation of the line tangent to a revenue function at a particular point is known to be $y = -9x + 3$. It is also known that at this particular point, the second derivative is negative. Given this information, which of the following can you conclude?

- a. The revenue function is decreasing at that point.
b. The revenue function is increasing at that point.
c. The revenue function is maximized at that point.
d. The revenue function is minimized at that point.

8. For the following problem (parts A-D), consider the function $f(x) = x^3 + 3x^2 - 9x - 13$

A. Find the intervals of x over which the function is increasing and decreasing. State your answer in interval notation. You must show your work to receive any credit.

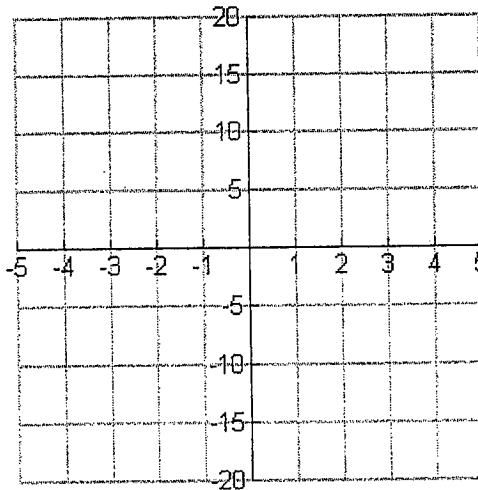
Decreasing on: _____

Increasing on: _____

B. Find all points in the form (x, y) at which max's and min's exist.

C. Find the x value at which this function has an inflection point. Show your work to receive credit.

D. Using the information in parts A through C and the end behavior of the graph, sketch the graph



9. For the function $g(x) = x^3 - 3x + 2$, find the intervals of x over which the function is concave up and concave down. You must show work to receive credit.

Concave down on: _____

Concave up on: _____

10. Find the exact values of x (no decimal approximations) at which $g'(x) = 0$ for the function $g(x) = x(4x-1)^3$ (Hint: After taking the derivative, you will need to factor so that you can solve). You must show your work to receive credit.

11. Find the absolute maximum and absolute minimum value of the function $f(x) = x \ln x$ on the interval $[0.3, 7]$. You must show work to receive credit.

Absolute min: _____

Absolute max: _____

12. The average cost function for producing x stereos is defined to be $\bar{C}(x) = 4x + 12 + \frac{900}{x}$. At what production level (x) is the average cost minimized?