

**Directions:**

**Turn off and put away all cell phones and other electronic devices.  
CALCULATORS are NOT allowed.**

Use only a #2 pencil for scantron form.  
Fill in the circles completely. Erase well any answer you wish to change.  
Make no stray marks on the answer sheet.

**ON THE SCANTRON FORM:**

In the boxes below NAME, write your last name, leave a blank box, then write as many letters of your first name as will fit. If your last name contains spaces (e.g. de la Vega), leave those spaces as a blank box. Then bubble the appropriate bubble below each letter of your name. The top bubble is the one to use for the blank box. You do not have to bubble any blank boxes that remain after your first name.

A grid for entering a name. The top row contains 15 empty boxes for writing the name. Below the boxes are 10 rows of bubbles. Each bubble contains a letter: the top row has a blank bubble followed by A-Z; the second row has A-Z; the third row has 0-9; the fourth row has 0-9; the fifth row has 0-9; the sixth row has 0-9; the seventh row has 0-9; the eighth row has 0-9; the ninth row has 0-9; the tenth row has 0-9.

At the bottom of the form, enter your 7-digit Panther ID number in boxes A through G. Bubble the appropriate bubble below each digit. You do not need to bubble the blank (top) bubble below boxes H, I, and J.

A grid for entering an identification number. The top row contains 7 boxes labeled A through G. Below the boxes are 10 rows of bubbles. Each bubble contains a digit: the top row has a blank bubble followed by 0-9; the second row has 0-9; the third row has 0-9; the fourth row has 0-9; the fifth row has 0-9; the sixth row has 0-9; the seventh row has 0-9; the eighth row has 0-9; the ninth row has 0-9; the tenth row has 0-9.

To the right of your name, Under GRADE OR EDUC, bubble  
1 if you have Form # 1 (green test)  
2 if you have Form # 2 (yellow test)  
3 if you have Form # 3 (pink test)  
4 if you have Form # 4 (blue test)

A vertical grid for entering grade or education level. It contains 10 rows of bubbles. The top row has a blank bubble followed by 1-4; the second row has 1-4; the third row has 1-4; the fourth row has 1-4; the fifth row has 1-4; the sixth row has 1-4; the seventh row has 1-4; the eighth row has 1-4; the ninth row has 1-4; the tenth row has 1-4.

Write MAC 1140 and your course section above NAME (top of the sheet)

Leave SEX, BIRTHDATE, and SPECIAL CODES blank.

Answer your test by bubbling in the answer to each question starting with problem 1, which is found to the right of SEX. There is no penalty for guessing. Each question has only one correct answer.

Correct answers are highlighted in yellow

MAC 1140 – Precalculus Algebra

Final Exam

Name: \_\_\_\_\_

Panther ID: \_\_\_\_\_

Instructor's Name: \_\_\_\_\_

The exam consists of two parts. Part I contains 17 multiple choice questions worth 3 pts each.

Part II contains 8 open ended questions worth 7 pts each.

**CALCULATORS ARE NOT ALLOWED** on this exam.

### PART I

**MULTIPLE CHOICE** questions. Choose the correct answer from five available choices. Circle the correct answer in this booklet and bubble in correct choice on the scantron form. Use available space to work out the problems. Your work in this part will **NOT** be graded.

1. Find the formula for the  $n$ th term,  $a_n$ , of the sequence.

$1 \cdot 5, 2 \cdot 6, 3 \cdot 7, 4 \cdot 8, 5 \cdot 9 \dots$

A)  $a_n = n(6 - n), \quad n \geq 1$

B)  $a_n = n(1 + 4n), \quad n \geq 1$

C)  $a_n = n(n - 4), \quad n \geq 1$

**D)  $a_n = n(4 + n), \quad n \geq 1$**

E) None of the above

2. Find the domain and the range of the inverse of  $f(x) = \frac{x+1}{x-3}$ .

A) Domain:  $(-\infty, +\infty)$ ; Range:  $(-\infty, 3) \cup (3 + \infty)$

B) Domain:  $(-\infty, 3) \cup (3 + \infty)$ ; Range:  $(-\infty, 1) \cup (1 + \infty)$

C) Domain:  $(-\infty, +\infty)$ ; Range:  $(-\infty, +\infty)$

**D) Domain:  $(-\infty, 1) \cup (1 + \infty)$ ; Range:  $(-\infty, 3) \cup (3 + \infty)$**

E) None of the above

3. Solve the given equation  $x^3 - 5x^2 - 9x + 45 = 0$ . The sum of the solutions is

- A) 5
- B) 3
- C) -5
- D) -3
- E) None of the above

4. Evaluate the binomial coefficient  $\binom{6}{2}$

- A) 1
- B) 0
- C) 6
- D) 15
- E) None of the above

5. If  $\log_2(2x+1) = 3$ , then  $x =$

- A) -3
- B) 3.5
- C) 1.5
- D) 1
- E) None of the above

6. Find the value of the following determinant

$$\begin{vmatrix} 2 & 4 & 5 \\ -2 & 4 & -1 \\ 1 & 1 & 1 \end{vmatrix}$$

- A) -16
- B) -8
- C) 20
- D) 10
- E) None of the above

7. The center of the ellipse  $4x^2 + y^2 + 16x + 6y + 21 = 0$  is

- A) (8, 18)
- B) (4, 6)
- C) (-2, -3)
- D) (-6, -4)
- E) None of the above

8. Use properties of logarithms to expand the logarithmic expression as much as possible.

$$\log \frac{xy^7}{z^2}$$

- A)  $\log x + \log y^7 + \log z^2$
- B)  $7 \log x + 7 \log y - 2 \log z$
- C)  $\log x + 7 \log y - 2 \log z$
- D)  $\frac{\log x + 7 \log y}{2 \log z}$
- E) None of the above

9. Express as a single logarithm and, if possible, simplify.

$$\ln(y^2 - 3y + 2) - \ln(y^2 - 1)$$

- A)  $\ln(3 - 3y)$
- B)  $\ln \frac{y - 2}{y + 1}$
- C)  $\ln(3y - 2)$
- D)  $\frac{\ln(y - 2)}{\ln(y - 1)}$
- E) None of the above

10. If  $f(x) = 4x^2 - 2x + 4$  and  $g(x) = x - 2$ , then the composition  $f \circ g$  is

- A)  $4x^2 - 8x + 16$
- B)  $4x^2 - 2x - 8$
- C)  $4x^2 - 18x + 24$
- D)  $4x^2 - 2x + 2$
- E) None of the above

11. Find the vertical asymptote(s) of the graph of  $f(x) = \frac{x - 4}{8x + x^2}$ .

- A)  $x = 0, x = -8$
- B)  $x = -8, x = 4$
- C)  $x = 4, x = 0$
- D)  $x = 0, x = 8$
- E) None of the above

12. List the potential rational zeros of the polynomial function  $f(x) = 7x^4 - x^2 + 3$ . Do not find the zeros.

A)  $\pm \frac{1}{7}, \pm \frac{1}{3}, \pm 1, \pm 2, \pm 7$

B)  $\pm \frac{1}{7}, \pm \frac{3}{7}, \pm 1, \pm 3$

C)  $\pm \frac{1}{7}, \pm \frac{3}{7}, \pm \frac{7}{3}, \pm 1, \pm 3, \pm 7$

D)  $\pm \frac{1}{3}, \pm \frac{7}{3}, \pm 1, \pm 7$

E) None of the above

13. Without completing the squares, identify the graph of the equation  $4x^2 - 3y^2 - 2x + 3y - 3 = 0$

A) ellipse

B) parabola

C) hyperbola

D) circle

E) not a conic

14. How many solutions does the system below have?

$$\begin{cases} y = -x^2 + 3 \\ x^2 + 4y^2 = 4 \end{cases}$$

A) 2

B) 4

C) 0

D) infinitely many

E) None of the above

15. Evaluate the sum  $\sum_{k=1}^4 \frac{k-1}{k+1}$

A)  $\frac{1}{2}$

B)  $\frac{8}{15}$

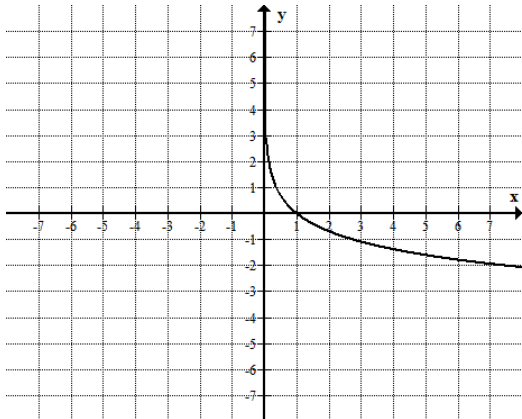
C)  $\frac{43}{30}$

D)  $\frac{17}{30}$

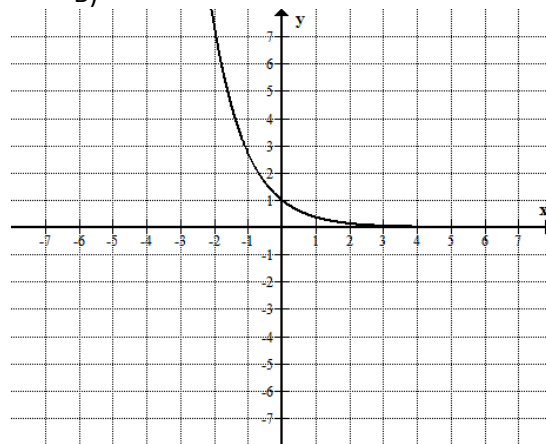
E) None of the above

16. Which of the following is the graph of the function  $f(x) = \ln x$

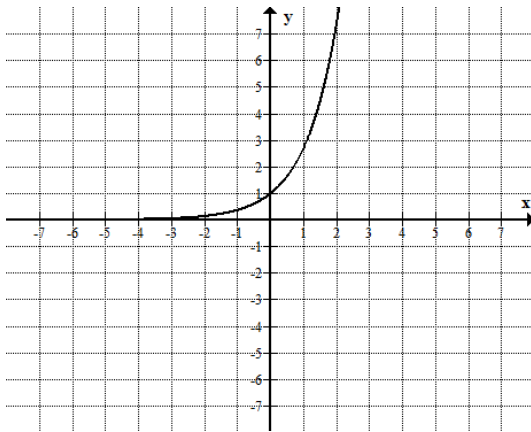
A)



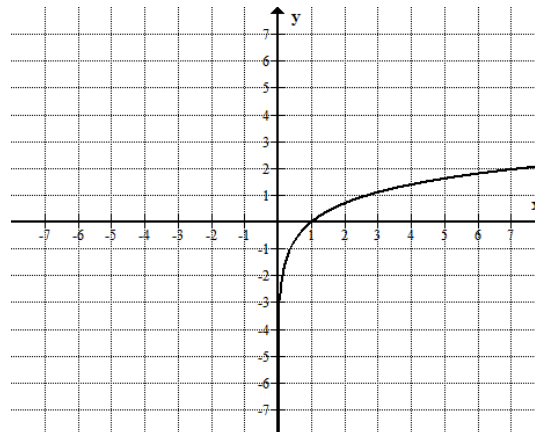
B)



C)



D)



E) None of the above

17. Find  $f(2)$ , for the function  $f(x) = \begin{cases} -x+3 & \text{if } x < 2 \\ 2x^2 - 3 & \text{if } x \geq 2 \end{cases}$

- A) 5
- B) 1
- C) -5
- D) 3
- E) None of the above

**THIS IS THE END OF PART I**

**PART II**

Show your work to earn full credit. Organize your solution, so it is clear what you do and why. Partial credit will be awarded but an answer alone will get no credit.

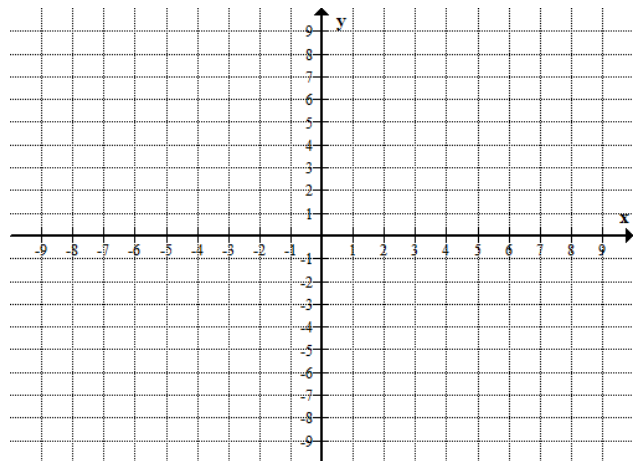
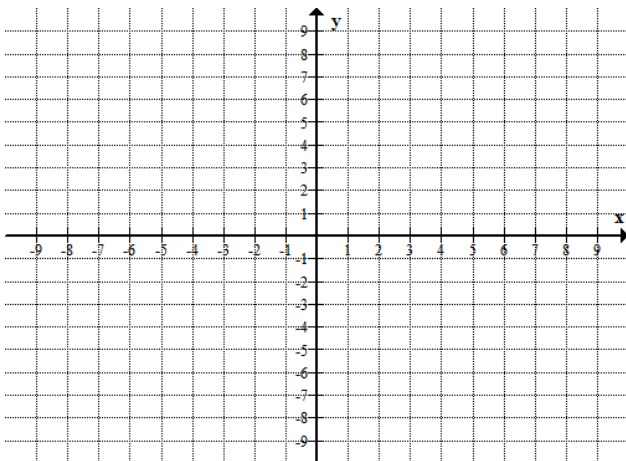
1. Graph  $f(x) = -2^{x+3} + 1$  using transformations. Start with the graph of a basic function- plot accurately at least 3 points and use them to perform transformations. Do one transformation at a time. Name the transformation and write the equation of the resulting function

(i)  $y =$  \_\_\_\_\_

(ii)  $y =$  \_\_\_\_\_

transformation: \_\_\_\_\_

transformation: \_\_\_\_\_

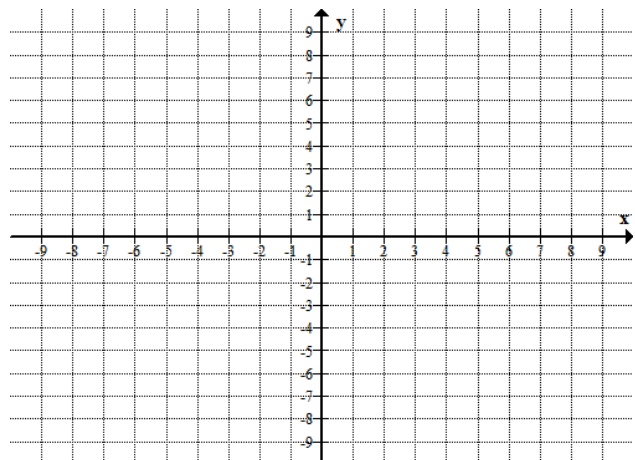
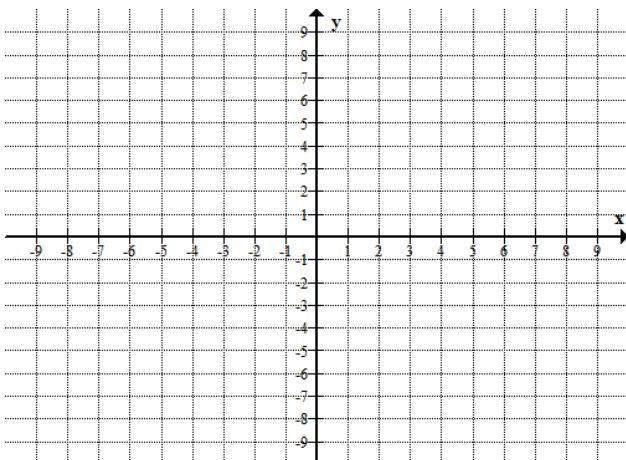


(iii)  $y =$  \_\_\_\_\_

(iv)  $y =$  \_\_\_\_\_

transformation: \_\_\_\_\_

transformation: \_\_\_\_\_



**2. Consider the infinite series  $\sum_{k=1}^{\infty} 5\left(\frac{2}{3}\right)^{k-1}$**

a) Explain, in words, why this series converges.

b) Find the sum of this series.

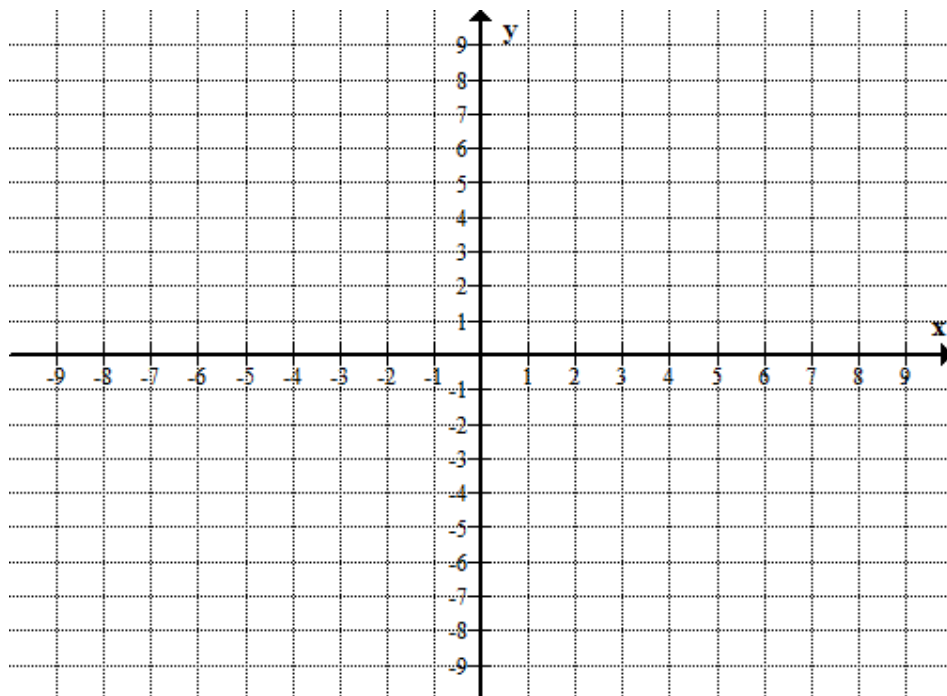
**3. Solve the inequality. Write the answer in the interval notation.**

$$x^4 + 2x^3 - 3x^2 < 0$$

**4. Solve the equation  $3^{x^2} = 81 \cdot 27^x$**

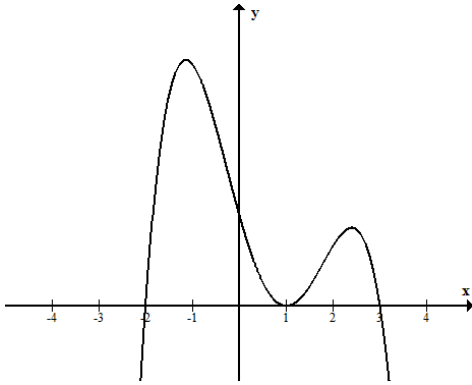


5. Find the equation of the parabola with focus at  $(-2,3)$  and the directrix  $y = -1$ . Sketch the graph of this parabola. Make sure it is as accurate as possible.



6. Expand using the Binomial Theorem  $(2x+1)^6$ .

7. The graph of a polynomial function  $f$  is given below. Answer the questions that follow.



- a) List the zeros of this function
- b) Based on the graph, what can you say about the multiplicity of each zero? Write your answer in the following format:

zero: \_\_\_\_\_ multiplicity: \_\_\_\_\_

- c) What is the smallest possible degree of this polynomial function?
- d) What can you say about the leading coefficient of this polynomial function? Fill in the blank.

The leading coefficient is a \_\_\_\_\_ number.

8. Find the domain of  $f(x) = \sqrt{\frac{x-4}{x}}$ . Write it in the interval or set builder notation.

