Student: _____	**Instructor:** Keith Barrs	**Assignment:** Sample Test 1
Date: _____	**Course:** Math 1113	
Time: _____	**Book:** Sullivan: Precalculus, 8e	

1. Determine whether the function is a polynomial function. If it is, state the degree. If it is not, tell why not.

$f(x) = -9x + x^6$

- A. Not a polynomial because of the negative power of x
- B. Not a polynomial because of the negative coefficient of x
- C. Polynomial of degree 6
- D. Polynomial of degree -9

---

2. Determine whether the function is a polynomial function. If it is, state the degree. If it is not, tell why not.

$f(x) = 9 - \frac{4}{x}$

Choose the correct answer below.

- A. Polynomial of degree 9
- B. Not a polynomial because of the negative power of x
- C. Not a polynomial because of the negative coefficient of $\frac{1}{x}$
- D. Polynomial of degree 4

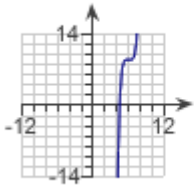
---

3. Use a transformation of the graph of $y = x^5$ to graph the function.

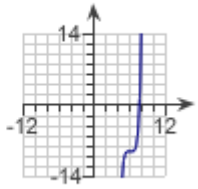
$f(x) = (x-6)^5 + 9$

Select the graph of $f(x) = (x-6)^5 + 9$.

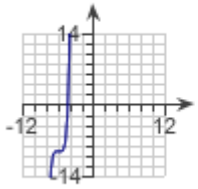
- A.



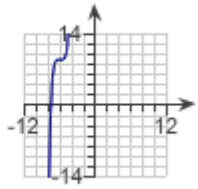
- B.



- C.



- D.



Student: _____	**Instructor:** Keith Barrs	**Assignment:** Sample Test 1
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4.

Form a polynomial whose zeros and degree are given.

Zeros: $-2, 2, 8$; degree: 3

Type a polynomial function with integer coefficients in the box below. You may enter the polynomial in factored form.

f(x) = ☐

5.

Form a polynomial whose zeros and degree are given.

Zeros: -4, multiplicity 1; 1, multiplicity 2; degree 3

Type a polynomial function in the box below.

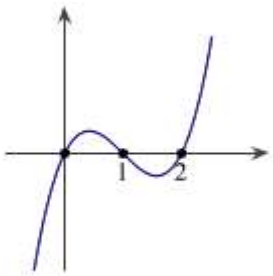
f(x) = ☐

(Write the polynomial in factored form, with each factor either in the form $(x+a)$ or $(x-a)$, depending on the sign of the zero.)

6.

Decide which of the polynomial functions in the list might have the graph below. (More than one answer may be possible.)

(a) $y=-4x(x-1)(x-2)$
(b) $y=x^2(x-1)^2(x-2)$
(c) $y=3x(x-1)(x-2)$
(d) $y=x(x-1)^2(x-2)^2$
(e) $y=x^3(x-1)(x-2)$
(f) $y=-x(1-x)(x-2)$



Which of the polynomial functions in the list might have the given graph?

☐

(Type a, b, c, d, e, or f. Use a comma to separate answers as needed.)

Student: _____	**Instructor:** Keith Barrs	**Assignment:** Sample Test 1
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Time: _____	**Book:** Sullivan: Precalculus, 8e	

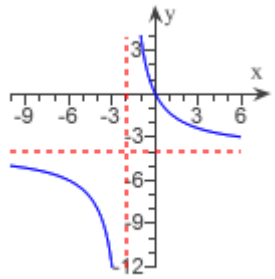
7. Find the domain of the following rational function.

$$H(x) = \frac{-6x^2}{(x-1)(x+6)}$$

The domain of H(x) is $\{x|x \neq \square\}$.
(Use a comma to separate answers as needed. Type N if there are no restrictions.)

---

8. Use the graph shown to find the following.
(a) The domain and range of the function
(b) The intercepts, if any
(c) Horizontal asymptotes, if any
(d) Vertical asymptotes, if any
(e) Oblique asymptotes, if any



(a) Inspection of the graph shows that the domain of the function consists of all real numbers x except $x = \square$.
(Use a comma to separate answers as needed. Type N if there are no restrictions.)

Inspection of the graph shows that the range of the function consists of all real numbers y except $y = \square$.
(Use a comma to separate answers as needed. Type N if there are no restrictions.)

(b) Inspection of the graph shows that there are x-intercepts at $x = \square$.
(Use a comma to separate answers as needed. Type N if there are no x-intercepts.)

Inspection of the graph shows that there are y-intercepts at $y = \square$.
(Use a comma to separate answers as needed. Type N if there is no y-intercept.)

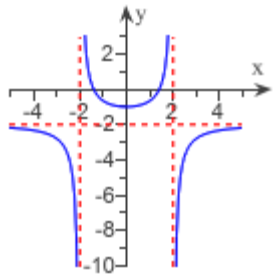
(c) Inspection of the graph shows there is a horizontal asymptote at $y = \square$.
(Type N if there is no horizontal asymptote.)

(d) Inspection of the graph shows that there is a vertical asymptote at $x = \square$.
(Type N if there is no vertical asymptote.)

(e) Inspection of the graph shows that there is an oblique asymptote with equation $y = \square$. (Type N if there is no oblique asymptote.)

9.

Use the graph shown to find the following.
(a) The domain and range of the function
(b) The intercepts, if any
(c) Horizontal asymptotes, if any
(d) Vertical asymptotes, if any
(e) Oblique asymptotes, if any



(a) Inspection of the graph shows that the domain of the function consists of all real numbers x in the set $\{x \mid x \neq \square\}$.
(Use a comma to separate answers as needed. Type N if there are no restrictions.)

Inspection of the graph shows that the range of the function consists of all real numbers y in the set $\{y \mid y < \square \text{ or } y \geq \square\}$.

(b) Inspection of the graph shows that there are x-intercepts at $x = \square$.
(Round to the nearest integer as needed. Use a comma to separate answers as needed. Type N if there are no x-intercepts.)

Inspection of the graph shows that there are y-intercepts at $y = \square$.
(Round to the nearest integer as needed. Use a comma to separate answers as needed. Type N if there are no y-intercepts.)

(c) Inspection of the graph shows there is a horizontal asymptote at $y = \square$.
(Type N if there is no horizontal asymptote.)

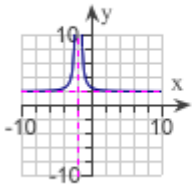
(d) Inspection of the graph shows that the leftmost vertical asymptote is at $x = \square$, and the rightmost vertical asymptote is at $x = \square$.

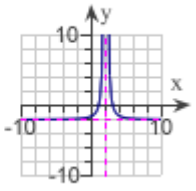
(e) Inspection of the graph shows that there is an oblique asymptote with equation $y = \square$.
(Type N if there is no oblique asymptote.)

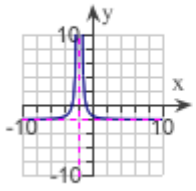
10. Graph the following rational function using transformations.

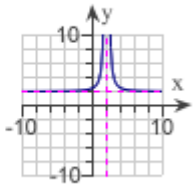
$$G(x) = 2 + \frac{2}{(x-2)^2}$$

Select the correct graph.

A. 

B. 

C. 

D. 

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11. Find the vertical, horizontal, and oblique asymptotes, if any, for the following rational function.

$$R(x) = \frac{2x}{x+6}$$

Vertical asymptote(s) at the line(s) x = ☐.
(Use a comma to separate answers as needed. Type N if there is no vertical asymptote.)

Horizontal asymptote at the line y = ☐.
(Type N if there is no horizontal asymptote.)

Oblique asymptote at the line y = ☐.
(Type N if there is no oblique asymptote.)

12. Find the vertical, horizontal, and oblique asymptotes, if any, of the given rational function.

$$R(x) = \frac{x^3 - 27}{x^2 - 8x + 15}$$

Vertical asymptote(s) at the line(s) x = ☐.
(Simplify your answer. Use a comma to separate answers as needed. Type N if there is no vertical asymptote.)

Horizontal asymptote at the line y = ☐.
(Simplify your answer. Use a comma to separate answers as needed. Type N if there is no horizontal asymptote.)

Oblique asymptote at the line y = ☐.
(Simplify your answer. Use a comma to separate answers as needed. Type N if there is no oblique asymptote.)

---

13. Find the vertical, horizontal, and oblique asymptotes, if any, for the following rational function.

$$T(x) = \frac{x^3}{x^4 - 81}$$

Vertical asymptote(s) at the line(s) x = ☐.
(Use a comma to separate answers as needed. Type N if there is no vertical asymptote.)

Horizontal asymptote at the line y = ☐.
(Type N if there is no horizontal asymptote.)

Oblique asymptote at the line y = ☐.
(Type N if there is no oblique asymptote.)

14. Analyze the graph of the function.

$$R(x) = \frac{x+11}{x(x+16)}$$

(a) What is the domain of R(x)?

- A. $\{x|x \neq 0 \text{ and } x \neq -11\}$
- B. $\{x|x \neq 0 \text{ and } x \neq -16 \text{ and } x \neq -11\}$
- C. $\{x|x \neq 0 \text{ and } x \neq -16\}$
- D. All real numbers

(b) What is the equation of the vertical asymptote(s) of R(x)?

x = ☐

(Use a comma to separate answers as needed. Type an integer or a fraction. Type N if there is no vertical asymptote.)

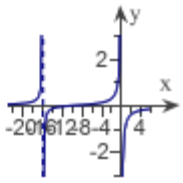
(c) What is the equation of the horizontal or oblique asymptote of R(x)?

y = ☐

(Simplify your answer. Type N if there is no horizontal/oblique asymptote.)

(d) Which graph shown below is the correct graph for R(x)?

A. 

B. 

C. 

D. 

15. Analyze the graph of the function.

$$R(x) = \frac{10x + 10}{3x + 9}$$

(a) What is the domain of R(x)?

- A. $\{x|x \neq 0 \text{ and } x \neq -3\}$
- B. $\{x|x \neq 0 \text{ and } x \neq -3 \text{ and } x \neq -1\}$
- C. $\{x|x \neq -3\}$
- D. All real numbers

(b) What is the equation of the vertical asymptote(s) of R(x)?

x = ☐

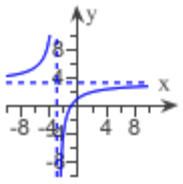
(Use a comma to separate answers as needed. Type an integer or a fraction. Type N if there is no vertical asymptote.)

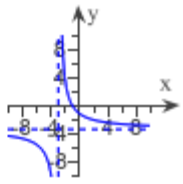
(c) What is the equation of the horizontal or oblique asymptote of R(x)?

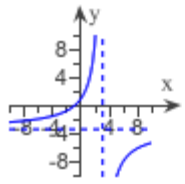
y = ☐

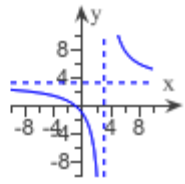
(Simplify your answer. Type N if there is no horizontal/oblique asymptote.)

(d) Which graph shown below is the correct graph for R(x)?

A. 

B. 

C. 

D. 

16. Analyze the graph of the function.

$$R(x) = \frac{x^4 + x^2 + 10}{x^2 - 64}$$

(a) What is the domain of R(x)?

- A. $\{x|x \neq 0\}$
- B. $\{x|x \neq 0 \text{ and } x \neq 8 \text{ and } x \neq -8\}$
- C. $\{x|x \neq 8 \text{ and } x \neq -8\}$
- D. All real numbers

(b) What is the equation of the vertical asymptote(s) of R(x)?

x = ☐

(Use a comma to separate answers as needed. Type an integer or a fraction. Type N if there is no vertical asymptote.)

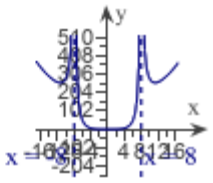
(c) What is the equation of the horizontal or oblique asymptote of R(x)?

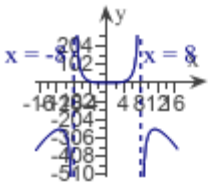
y = ☐

(Simplify your answer. Type N if there is no horizontal/oblique asymptote.)

(d) Which graph shown below is the correct graph for R(x)?

A. 

B. 

C. 

D. 

17. Analyze the graph of the function.

$$R(x) = \frac{8}{(x-5)(x^2-64)}$$

(a) What is the domain of $R(x)$?

- A. $\{x|x \neq 0, x \neq 5, x \neq 64, \text{ and } x \neq -64\}$
- B. $\{x|x \neq 0, x \neq 5, x \neq -8, \text{ and } x \neq 8\}$
- C. $\{x|x \neq 5, x \neq -8, \text{ and } x \neq 8\}$
- D. All real numbers

(b) What is the equation of the vertical asymptote(s) of $R(x)$?

x = ☐

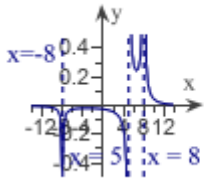
(Use a comma to separate answers as needed. Type an integer or a fraction. Type N if there is no vertical asymptote.)

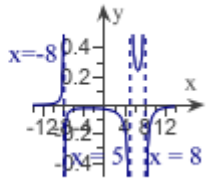
(c) What is the equation of the horizontal or oblique asymptote of $R(x)$?

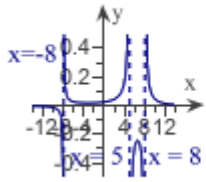
y = ☐

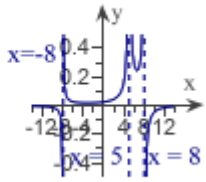
(Simplify your answer. Type N if there is no horizontal/oblique asymptote.)

(d) Which of the following shows the correct graph for $R(x)$?

A. 

B. 

C. 

D. 

18. Solve the following inequality.

$$(x+6)^2(x-7) < 0$$

What is the solution?

☐ (Type your answer in interval notation.)

19. Solve the following inequality.

$$x^3 - 9x^2 < 0$$

Choose the correct solution.

- A. $(9,\infty)$
- B. $(-\infty,0]$ or $[0,9]$
- C. $(-\infty,0)$ or $(0,9)$ or $(9,\infty)$
- D. $(-\infty,0)$ or $(0,9)$
- E. $(-\infty,\infty)$
- F. $\varnothing$

---

20. Solve the following inequality.

$$4x^3 > 36x^2$$

What is the solution?

(Type your answer in interval notation.)

---

21. Solve the following inequality.

$$\frac{(x-4)(x+8)}{x} \leq 0$$

Choose the correct solution.

- A. $(-\infty,-8]$ or $[-8,0)$ or $(0,4)$ or $(4,\infty)$
- B. $[-8,0)$ or $[4,\infty)$
- C. $(-\infty,-8)$ or $(0,4)$
- D. $(-\infty,-8]$ or $(0,4]$
- E. $(-\infty,\infty)$
- F. $\varnothing$

22. Solve the following inequality.

$$\frac{x+17}{x-4} \geq 1$$

Choose the correct solution.

- A. $(-\infty,4)$ or $(4,\infty)$
- B. $[4,\infty)$
- C. $(-\infty,4)$
- D. $(4,\infty)$
- E. $(-\infty,\infty)$
- F. $\varnothing$

---

23. Solve the following inequality.

$$\frac{6}{x-8} < \frac{7}{6x-7}$$

Choose the correct solution.

- A. $\left(-\infty,-\frac{14}{29}\right]$ or $(8,\infty)$
- B. $\left(-\frac{14}{29},\frac{7}{6}\right)$ or $(8,\infty)$
- C. $\left(-\infty,-\frac{14}{29}\right)$ or $\left(\frac{7}{6},8\right)$
- D. $\left(-\infty,-\frac{14}{29}\right)$
- E. $(-\infty,\infty)$
- F. $\varnothing$

---

24. Use the remainder theorem to find the remainder when $f(x)$ is divided by $x-2$. Then use the factor theorem to determine whether $x-2$ is a factor of $f(x)$.

$$f(x) = 3x^3 - 2x^2 - 4x - 6$$

The remainder is $\square$.

Is $x-2$ a factor of $f(x) = 3x^3 - 2x^2 - 4x - 6$?

- No
- Yes

25.

Tell the maximum number of zeros that the polynomial function may have. Then use Descartes' Rule of Signs to determine how many positive and how many negative real zeros the polynomial function may have. Do not attempt to find the zeros.

$f(x) = -3x^7 + x^3 - x^2 + 3$

What is the maximum number of zeros that this polynomial function can have?

☐

How many positive real zeros can the function have?

☐ (Use a comma to separate answers as needed.)

How many negative real zeros can the function have?

☐ (Use a comma to separate answers as needed.)

26.

Tell the maximum number of zeros that the polynomial function may have. Then use Descartes' Rule of Signs to determine how many positive and how many negative real zeros the polynomial function may have. Do not attempt to find the zeros.

$f(x) = 6x^4 + 8x^2 - 2$

What is the maximum number of zeros that this polynomial function can have?

☐

How many positive real zeros can the function have?

☐ (Use a comma to separate answers as needed.)

How many negative real zeros can the function have?

☐ (Use a comma to separate answers as needed.)

27. List the potential rational zeros of the polynomial function. Do not attempt to find the zeros.

$$f(x) = 2x^4 - 3x^3 + x^2 - x + 1$$

Choose the answer below that lists the potential rational zeros.

A. $-1, 1, -2, 2, -3, 3, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{3}, \frac{1}{3}$

B. $-1, 1, -2, 2$

C. $-1, 1, -\frac{1}{2}, \frac{1}{2}$

D. $-1, 1, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{3}, \frac{1}{3}$

---

28. List the potential rational zeros of the polynomial function. Do not attempt to find the zeros.

$$f(x) = 33x^4 - x^2 + 121$$

Choose the answer below that lists the potential rational zeros.

A. $-1, 1, -11, 11, -121, 121, -\frac{1}{11}, \frac{1}{11}, -\frac{1}{3}, \frac{1}{3}, -\frac{1}{33}, \frac{1}{33}$

B. $-1, 1, -11, 11, -121, 121, -\frac{1}{11}, \frac{1}{11}, -\frac{1}{3}, \frac{1}{3}, -\frac{1}{33}, \frac{1}{33}, -\frac{3}{11}, \frac{3}{11}, -\frac{3}{121}, \frac{3}{121}$

C. $-1, 1, -11, 11, -121, 121, -\frac{1}{11}, \frac{1}{11}, -\frac{1}{3}, \frac{1}{3}, -\frac{1}{33}, \frac{1}{33}, -\frac{11}{3}, \frac{11}{3}, -\frac{121}{3}, \frac{121}{3}$

D. $-1, 1, -11, 11, -3, 3, -33, 33, -\frac{1}{11}, \frac{1}{11}, -\frac{1}{3}, \frac{1}{3}, -\frac{1}{33}, \frac{1}{33}, -\frac{3}{11}, \frac{3}{11}, -\frac{3}{121}, \frac{3}{121}$

29.

Use the rational zeros theorem to find all the real zeros of the polynomial function. Use the zeros to factor f over the real numbers.

$$f(x) = x^3 + 5x^2 - 17x - 21$$

Find the real zeros of f.

x = ☐

(Simplify your answer. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed. Type each answer only once; do not duplicate answers in the case of repeated roots. Type N if the root is not a real number.)

Use the real zeros to factor f.

f(x) = ☐

(Simplify your answer. Type your answer in factored form.)

30.

Use the rational zeros theorem to find all the real zeros of the polynomial function. Use the zeros to factor f over the real numbers.

$$f(x) = 3x^4 + 2x^3 - 7x^2 - 4x + 2$$

Find the real zeros of f.

x = ☐

(Simplify your answer. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed. Type each answer only once; do not duplicate answers in the case of repeated roots. Type N if the root is not a real number.)

Use the real zeros to factor f.

f(x) = ☐

(Simplify your answer. Type your answer in factored form.)

31. Use the Intermediate Value Theorem to show that the polynomial function has a zero in the given interval.

$f(x) = 8x^4 - 3x^2 + 4x - 1; \quad [0, 3]$

Enter the value of $f(0)$.

$f(0) =$ ☐ (Simplify.)

Enter the value of $f(3)$.

$f(3) =$ ☐ (Simplify.)

According to the Intermediate Value Theorem, does f have a zero in the given interval?

- ○ No
- ○ Yes

---

32. Information is given about a polynomial $f(x)$ whose coefficients are real numbers. Find the remaining zeros of f.

Degree 3; zeros: $7, \ -9 - i$

Enter the remaining zeros of f.

☐ (Use a comma to separate answers as needed.)

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33. Information is given about a polynomial $f(x)$ whose coefficients are real numbers. Find the remaining zeros of f.

Degree 6; zeros: $3, \ -1 + i, \ -2 - i, \ -9$

Enter the remaining zeros of f.

☐ (Use a comma to separate answers as needed.)

34. Use the given zero to find the remaining zeros of the function.

$f(x) = x^3 - 7x^2 + 25x - 175$; zero: $-5i$

Enter the remaining zeros of f.

☐ (Use a comma to separate answers as needed.)

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35. Use the given zero to find the remaining zeros of the function.

$h(x) = 3x^4 + 10x^3 + 4x^2 + 40x - 32$; zero: $-2i$

The zeros of h are ☐.
(Use a comma to separate answers as needed. Use integers or fractions for any numbers in the expression.)

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36. Use the given zero to find the remaining zeros of the function.

$h(x) = x^4 - 12x^3 + 40x^2 + 16x - 240$ zero: $4 - 2i$

Enter the remaining zeros of f.

☐ (Use a comma to separate answers as needed.)

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37. Find the complex zeros of the polynomial function. Write f in factored form.

$f(x) = x^4 + 12x^3 - 9x^2 + 48x - 52$

The complex zeros of f are ☐.
(Use a comma to separate answers as needed.)

Write f in factored form.

$f(x) =$ ☐ (Factor completely.)

Student: _____	**Instructor:** Keith Barrs	**Assignment:** Sample Test 1
Date: _____	**Course:** Math 1113	
Time: _____	**Book:** Sullivan: Precalculus, 8e	

1. C

2. B

3. A

4. $(x+2)(x-2)(x-8)$

5. $(x+4)(x-1)^2$

6. c,e,f

7. $1, -6$

8. -2
   -4
   0
   0
   -4
   -2
   N

9. $-2,2$
   -2
   -1
   $1, -1$
   -1
   -2
   -2
   2
   N

10. D

11. -6
    2
    N

12. 5
    N
    $x+8$

13. $-3,3$
0
N

14. C
$0,-16$
0
C

15. C
-3
$\frac{10}{3}$
A

16. C
$-8,8$
N
A

17. C
$5,8,-8$
0
C

18. $(-\infty,-6) \cup (-6,7)$

19. D

20. $(9,\infty)$

21. D

22. D

23. C

24. 2
the first choice

25. 7
3,1
2,0

26. 4
1
1

27. C

28. C

29. $-7, -1, 3$
$(x+1)(x+7)(x-3)$

30. $-\sqrt{2}, -1, \sqrt{2}, \frac{1}{3}$
$3\left(x-\frac{1}{3}\right)(x+1)(x-\sqrt{2})(x+\sqrt{2})$

31. -1
632
the second choice

32. $-9+i$

33. $-1-i, -2+i$

34. $5i, 7$

35. $-2i, 2i, \frac{2}{3}, -4$

36. $4+2i, -2, 6$

37. $-13, 1, -2i, 2i$
$(x+13)(x-1)(x-2i)(x+2i)$