Pre-Calculus
Final Review #1

Name_____

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

Find an explicit rule for the nth term of the sequence.

1) 9, 18, 36, 72, ...

A) $a_n = 9 \cdot 2^n$ B) $a_n = 2 \cdot 9^{n-1}$

C) $a_n = 9 \cdot 2^{n+1}$ D) $a_n = 9 \cdot 2^{n-1}$

Write out the first five terms of the sequence.

2) $c_n = \frac{n+2}{3}$

A) $\frac{2}{3}, 1, \frac{4}{3}, \frac{5}{3}, 2$

B) $\frac{2}{3}, \frac{2}{3}, \frac{2}{3}, \frac{2}{3}, \frac{2}{3}$

C) $1\frac{2}{3}, 2\frac{2}{3}, 3\frac{2}{3}, 4\frac{2}{3}, 5\frac{2}{3}$

D) $1, \frac{4}{3}, \frac{5}{3}, 2, \frac{7}{3}$

Write the series using summation notation.

3) 9 + 11 + 13 + 15 + ... + 2n+1 ...

A) $\sum_{n=5}^{20} (2n+1)$ B) $\sum_{n=5}^{\infty} (2n+1)$

C) $\sum_{n=4}^{20} (2n+1)$ D) $\sum_{n=4}^{\infty} (2n+1)$

4) 1000 + 1331 + 1728 + 2197 + ... + n^3 + ...

A) $\sum_{n=10}^{\infty} (n+1)^3$ B) $\sum_{n=11}^{\infty} n^3$

C) $\sum_{n=10}^{\infty} (n-1)^3$ D) $\sum_{n=10}^{\infty} n^3$

5) -1 + 3 + 7 + 11 + ... + 59

A) $\sum_{n=0}^{15} (-1 + n \cdot 4)$

B) $\sum_{n=0}^{\infty} -4n$

C) $\sum_{n=0}^{15} -4 \cdot n$

D) $\sum_{n=0}^{\infty} (-1 + n \cdot 4)$

Solve.

6) A certain species of tree grows an average of 4.5 cm per week. Write an explicit rule for the sequence that represents the weekly height of this tree in centimeters if the measurements begin when the tree is 4 meters tall.

A) $h_n = 400 + 4.5n$

B) $h_n = 4 + 4.5n$

C) $h_n = 4000 + 4.5n$

D) $h_n = 400 + 450n$

7) An auditorium has 25 rows with 10 seats in the first row, 12 in the second row, 14 in the third row, and so forth. How many seats are in the auditorium?

A) 550 B) 500

C) 900 D) 850

Identify intervals on which the function is increasing, decreasing, or constant.

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

A) Increasing: $(-\infty, 0)$ and $(0.67, \infty)$; decreasing: $(0, 0.67)$

B) Increasing: $(-\infty, -2)$ and $(2, \infty)$; decreasing: $(-2, 2)$

C) Increasing: $(-\infty, 0)$ and $(0.67, \infty)$; constant: $(0, 0.67)$

D) Increasing: $(0, 0.67)$; decreasing: $(-\infty, 0)$ and $(0.67, \infty)$

Determine if the function is bounded above, bounded below, bounded on its domain, or unbounded on its domain.

9) $y = 4^{-x} + 1$

A) Bounded above
B) Bounded
C) Bounded below
D) Unbounded

10) $y = 2x - x^3$

A) Bounded below
B) Bounded above
C) Bounded
D) Unbounded

Find the domain of the given function.

11) $f(x) = \sqrt{14 - x}$

A) All real numbers
B) $(-\infty, 14) \cup (14, \infty)$
C) $(\sqrt{14}, \infty)$
D) $(-\infty, 14]$

12) $f(x) = \dfrac{x}{x^2 + 3x}$

A) $(-\infty, 0) \cup (0, \infty)$
B) $(-\infty, -3) \cup (-3, \infty)$
C) $(-\infty, 0) \cup (0, 3) \cup (3, \infty)$
D) $(-\infty, -3) \cup (-3, 0) \cup (0, \infty)$

13) $f(x) = \dfrac{\sqrt{x + 9}}{(x + 4)(x - 8)}$

A) $[-9, -4) \cup (-4, 8) \cup (8, \infty)$
B) $(-\infty, -9) \cup (-9\ -4) \cup (-4, 8) \cup (8, \infty)$
C) All real numbers
D) $(0, \infty)$

Solve the problem.

14) Estimate graphically the local maximum and local minimum of $f(x) = \dfrac{1}{3}x^3 + x^2 - 3x$.

A) Local maximum: 8.53; local minimum: -2.01
B) Local maximum: 9; local minimum: 1.06
C) Local maximum: 1.67; local minimum: -9
D) Local maximum: 9; local minimum: -1.67

Determine algebraically whether the function is even, odd, or neither even nor odd.

15) $f(x) = 3x^2 - 3$

A) Neither
B) Even
C) Odd

16) $f(x) = -5x^5 - 3x^3$

A) Odd
B) Even
C) Neither

17) $f(x) = 8x^4 + 5x + 4$

A) Even
B) Odd
C) Neither

18) $f(x) = 13\sqrt[3]{x}$

A) Neither
B) Even
C) Odd

Find the asymptote(s) of the given function.

19) $h(x) = \dfrac{(x - 1)(x + 5)}{x^2 - 4}$ vertical asymptotes(s)

A) None
B) $x = 1, x = -5$
C) $x = 2, x = -2$
D) $x = -1, x = 5$

20) $f(x) = \dfrac{x - 2}{x^2 + 3x}$ vertical asymptotes(s)

A) $x = 0, x = -3$
B) $x = -3$
C) $x = 2$
D) $x = 3$

21) $g(x) = \dfrac{x - 5}{(x - 9)(x + 8)}$ vertical asymptotes(s)

A) $x = -5$
B) $x = -9, x = 8$
C) $x = 9, x = -8$
D) $x = 5$

Describe how to transform the graph of f into the graph of g.

22) $f(x) = \sqrt{x}$ and $g(x) = 2\sqrt{x}$

A) Vertically stretch the graph of f by a factor of 2.

B) Horizontally shrink the graph of f by a factor of $\frac{1}{2}$.

C) Horizontally stretch the graph of f by a factor of 2.

D) Vertically shrink the graph of f by a factor of $\frac{1}{2}$.

Describe how the graph of $y=x^2$ can be transformed to the graph of the given equation.

23) $y = (x + 14)^2$

A) Shift the graph of $y = x^2$ left 14 units.

B) Shift the graph of $y = x^2$ down 14 units.

C) Shift the graph of $y = x^2$ right 14 units.

D) Shift the graph of $y = x^2$ up 14 units.

24) $y = (x - 13)^2 + 19$

A) Shift the graph of $y = x^2$ left 13 units and then up 19 units.

B) Shift the graph of $y = x^2$ right 13 units and then up 19 units.

C) Shift the graph of $y = x^2$ up 13 units and then right 19 units.

D) Shift the graph of $y = x^2$ left 13 units and then down 19 units.

Describe how to transform the graph of f into the graph of g.

25) $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{8}\sqrt{x}$

A) Horizontally stretch the graph of f by a factor of $\frac{1}{8}$.

B) Vertically stretch the graph of f by a factor of $\frac{1}{8}$.

C) Horizontally shrink the graph of f by a factor of $\frac{1}{8}$.

D) Vertically shrink the graph of f by a factor of $\frac{1}{8}$.

Find a cubic function with the given zeros.

26) -7, 3, -3

A) $f(x) = x^3 + 7x^2 - 9x - 63$

B) $f(x) = x^3 - 7x^2 - 9x - 63$

C) $f(x) = x^3 + 7x^2 - 9x + 63$

D) $f(x) = x^3 + 7x^2 + 9x - 63$

Solve the polynomial inequality.

27) $(x + 7)(x + 6)(x + 2) > 0$

A) $(-\infty, -7) \cup (-6, -2)$

B) $(-7, -6) \cup (-2, \infty)$

C) $(-\infty, -6)$

D) $(-2, \infty)$

28) $(x - 3)(x^2 - 3x - 10) < 0$

A) $(-2, 3) \cup (5, \infty)$ B) $(-\infty, -2) \cup (3, \infty)$

C) $(-\infty, 5)$ D) $(-\infty, -2) \cup (3, 5)$

29) $x^3 + 4x^2 - 9x - 36 \geq 0$

A) $[-4, 3]$ B) $[-3, 3] \cup [4, \infty)$

C) $[-4, \infty)$ D) $[-4, -3] \cup [3, \infty)$

Find the exact solution to the equation.

30) $\log_4(x - 2) = -1$

A) $x = 2$ B) $x = 2.25$

C) $x = 6$ D) $x = -1.75$

31) $10 - \log_5(x + 9) = 9$

A) $x = 4$ B) $x = 14$

C) $x = -4$ D) $x = -8$

Find the remainder when f(x) is divided by (x - k)

32) $f(x) = 2x^3 + 3x^2 + 4x + 18$; $k = -2$

A) 6 B) 10

C) -38 D) -60

33) $f(x) = 4x^2 + 2x + 5$; $k = 1$

A) 9 B) 7 C) 11 D) 13

Use the Factor Theorem to determine whether the first polynomial is a factor of the second polynomial.

34) $x - 4$; $2x^2 - 17x + 36$

A) No B) Yes

35) $x + 2$; $9x^4 + 19x^3 - 2x^2 + x + 4$

A) Yes B) No

Convert from degrees to radians. Use the value of π found on a calculator and round answers to four decimal places, as needed.

36) 570°

A) $\frac{19\pi}{6}$ B) $\frac{19\pi}{12}$

C) $\frac{19\pi}{3}$ D) $\frac{19\pi}{5}$

37) 144°

A) $\frac{8\pi}{5}$ B) $\frac{3\pi}{5}$

C) $\frac{4\pi}{5}$ D) $\frac{2\pi}{5}$

Convert the radian measure to degree measure. Use the value of π found on a calculator and round answers to two decimal places.

38) $\pi/5$

A) $(\pi/5)°$ B) $36\pi°$

C) 36° D) 0.628°

Find the exact value of the real number y.

39) $y = \arccos\left(\frac{\sqrt{3}}{2}\right)$

A) $\frac{\pi}{6}$ B) $\frac{5\pi}{6}$

C) $\frac{\pi}{3}$ D) $-\frac{\pi}{3}$

40) $y = \sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

A) $-\frac{7\pi}{4}$ B) $-\frac{\pi}{4}$

C) $\frac{\pi}{3}$ D) $\frac{\pi}{4}$