Pre-Calculus Name_____ ID: 1

Assignment

Date_____ Period____

State the possible rational zeros for each function. Then find all rational zeros.

1) $f(x) = 2x^3 - 9x^2 - 43x - 20$

2) $f(x) = 2x^3 - 15x^2 - 16x - 4$

3) $f(x) = x^3 + x^2 + 4x - 20$

4) $f(x) = 6x^3 + 28x^2 + 25x + 6$

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

6) $f(x) = 3x^3 - 10x^2 - 18x + 7$

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

8) $f(x) = 3x^3 + 34x^2 - 57x + 22$

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

10) $f(x) = 3x^3 + 5x^2 - 11x + 3$

11) $f(x) = 3x^3 + x^2 - 5x + 10$

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

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

14) $f(x) = 3x^3 - 5x^2 + x + 1$

15) $f(x) = 2x^3 + 17x^2 + 36x + 5$

16) $f(x) = 6x^3 + 11x^2 - 2x - 3$

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

18) $f(x) = 6x^3 + x^2 - 11x - 5$

19) $f(x) = x^3 - 6x^2 - 11x + 10$

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

21) $f(x) = x^3 - 4x^2 - 11x + 2$

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

23) $f(x) = 5x^3 + x^2 - 5x - 1$

24) $f(x) = 3x^3 + 17x^2 - 24x + 6$

25) $f(x) = x^3 + 3x^2 - 20$

26) $f(x) = 4x^3 - 9x^2 + 6x - 1$

27) $f(x) = 5x^3 + 59x^2 - 17x + 1$

28) $f(x) = 3x^3 - 8x^2 + 5x - 2$

29) $f(x) = 5x^3 + 9x^2 + 3x - 1$

30) $f(x) = x^3 - 12x^2 + 30x - 9$

31) $f(x) = x^3 + 12x^2 + 15x - 10$

32) $f(x) = x^3 + 2x^2 + 3x + 18$

33) $f(x) = 6x^3 + 23x^2 + 2x - 4$

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

35) $f(x) = x^3 + 5x^2 - 6x - 24$

36) $f(x) = 5x^3 - 11x^2 + 7x - 1$

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

38) $f(x) = 3x^3 + 35x^2 - 4$

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

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

41) $f(x) = 4x^3 - 27x + 5$

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

43) $f(x) = x^3 - 4x^2 - 5x + 14$

44) $f(x) = 5x^3 + 19x^2 - 29x + 5$

45) $f(x) = 2x^3 - 3x^2 - 26x + 3$

46) $f(x) = 2x^3 - 12x^2 + 23x - 14$

47) $f(x) = 2x^3 + 27x^2 + 57x + 5$

48) $f(x) = 2x^3 - 14x^2 + 29x - 18$

49) $f(x) = 2x^3 + 4x^2 - 9x - 14$

50) $f(x) = 6x^3 + 32x^2 + 31x + 7$

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

52) $f(x) = 3x^3 - 11x^2 - 22x - 6$

53) $f(x) = 3x^3 - 23x^2 + 49x - 45$

54) $f(x) = 3x^3 + 5x^2 + x - 1$

55) $f(x) = 3x^3 + 7x^2 + 5x + 1$

56) $f(x) = x^3 + 2x^2 - 32x - 15$

57) $f(x) = x^3 + 14x^2 + 29x + 10$

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

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

60) $f(x) = 2x^3 + 5x^2 + 4x + 1$

Pre-Calculus Name_____ ID: 1

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State the possible rational zeros for each function. Then find all rational zeros.

1) $f(x) = 2x^3 - 9x^2 - 43x - 20$

Possible rational zeros:

$\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20, \pm \frac{1}{2}, \pm \frac{5}{2}$

Rational zeros: $\left\{-\frac{5}{2}\right\}$

2) $f(x) = 2x^3 - 15x^2 - 16x - 4$

Possible rational zeros: $\pm 1, \pm 2, \pm 4, \pm \frac{1}{2}$

Rational zeros: $\left\{-\frac{1}{2}\right\}$

3) $f(x) = x^3 + x^2 + 4x - 20$

Possible rational zeros:

$\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$

Rational zeros: $\{2\}$

4) $f(x) = 6x^3 + 28x^2 + 25x + 6$

Possible rational zeros:

$\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{1}{6}$

Rational zeros: $\left\{-\frac{2}{3}\right\}$

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

Possible rational zeros: $\pm 1, \pm 2$

Rational zeros: $\{-2, -1, 1\}$

6) $f(x) = 3x^3 - 10x^2 - 18x + 7$

Possible rational zeros: $\pm 1, \pm 7, \pm \frac{1}{3}, \pm \frac{7}{3}$

Rational zeros: $\left\{\frac{1}{3}\right\}$

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

Possible rational zeros: $\pm 1, \pm 3$

Rational zeros: $\{3, 1, -1\}$

8) $f(x) = 3x^3 + 34x^2 - 57x + 22$

Possible rational zeros:

$\pm 1, \pm 2, \pm 11, \pm 22, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{11}{3}, \pm \frac{22}{3}$

Rational zeros: $\left\{\frac{2}{3}\right\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}$

Rational zeros: $\left\{\frac{1}{4}, 1, -1\right\}$

10) $f(x) = 3x^3 + 5x^2 - 11x + 3$

Possible rational zeros: $\pm 1, \pm 3, \pm \frac{1}{3}$

Rational zeros: $\left\{\frac{1}{3}, -3, 1\right\}$

11) $f(x) = 3x^3 + x^2 - 5x + 10$

Possible rational zeros:

$\pm 1, \pm 2, \pm 5, \pm 10, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{5}{3}, \pm \frac{10}{3}$

Rational zeros: $\{-2\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}$

Rational zeros: $\left\{-\frac{1}{4}, 1, -1\right\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{3}$

Rational zeros: $\left\{-1, 1, \frac{1}{3}\right\}$

14) $f(x) = 3x^3 - 5x^2 + x + 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{3}$

Rational zeros: $\left\{-\frac{1}{3}, 1 \text{ mult. } 2\right\}$

15) $f(x) = 2x^3 + 17x^2 + 36x + 5$

Possible rational zeros: $\pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}$

Rational zeros: $\{-5\}$

16) $f(x) = 6x^3 + 11x^2 - 2x - 3$

Possible rational zeros:

$\pm 1, \pm 3, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}$

Rational zeros: $\left\{-\frac{1}{2}\right\}$

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

Possible rational zeros: $\pm 1, \pm 2, \pm \frac{1}{2}$

Rational zeros: $\left\{-\frac{1}{2}, -1, 2\right\}$

18) $f(x) = 6x^3 + x^2 - 11x - 5$

Possible rational zeros:

$\pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}, \pm \frac{1}{3}, \pm \frac{5}{3}, \pm \frac{1}{6}, \pm \frac{5}{6}$

Rational zeros: $\left\{-\frac{1}{2}\right\}$

19) $f(x) = x^3 - 6x^2 - 11x + 10$

Possible rational zeros: $\pm 1, \pm 2, \pm 5, \pm 10$

Rational zeros: $\{-2\}$

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

Possible rational zeros: $\pm 1, \pm 5$

Rational zeros: $\{1, 5, -1\}$

21) $f(x) = x^3 - 4x^2 - 11x + 2$

Possible rational zeros: $\pm 1, \pm 2$
Rational zeros: $\{-2\}$

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

Possible rational zeros: $\pm 1, \pm 2, \pm \frac{1}{2}$

Rational zeros: $\left\{1, \frac{1}{2}, -2\right\}$

23) $f(x) = 5x^3 + x^2 - 5x - 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{5}$

Rational zeros: $\left\{-\frac{1}{5}, 1, -1\right\}$

24) $f(x) = 3x^3 + 17x^2 - 24x + 6$

Possible rational zeros:

$\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{3}, \pm \frac{2}{3}$

Rational zeros: $\left\{\frac{1}{3}\right\}$

25) $f(x) = x^3 + 3x^2 - 20$

Possible rational zeros:

$\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$

Rational zeros: $\{2\}$

26) $f(x) = 4x^3 - 9x^2 + 6x - 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}$

Rational zeros: $\left\{1 \text{ mult. } 2, \frac{1}{4}\right\}$

27) $f(x) = 5x^3 + 59x^2 - 17x + 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{5}$

Rational zeros: $\left\{\frac{1}{5}\right\}$

28) $f(x) = 3x^3 - 8x^2 + 5x - 2$

Possible rational zeros: $\pm 1, \pm 2, \pm \frac{1}{3}, \pm \frac{2}{3}$

Rational zeros: $\{2\}$

29) $f(x) = 5x^3 + 9x^2 + 3x - 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{5}$

Rational zeros: $\left\{\frac{1}{5}, -1 \text{ mult. } 2\right\}$

30) $f(x) = x^3 - 12x^2 + 30x - 9$

Possible rational zeros: $\pm 1, \pm 3, \pm 9$
Rational zeros: $\{3\}$

31) $f(x) = x^3 + 12x^2 + 15x - 10$

Possible rational zeros: $\pm 1, \pm 2, \pm 5, \pm 10$
Rational zeros: $\{-2\}$

32) $f(x) = x^3 + 2x^2 + 3x + 18$

Possible rational zeros:
$\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$
Rational zeros: $\{-3\}$

33) $f(x) = 6x^3 + 23x^2 + 2x - 4$

Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm \frac{1}{6}$
Rational zeros: $\left\{-\frac{1}{2}\right\}$

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

Possible rational zeros: $\pm 1, \pm 5$
Rational zeros: $\{-5, -1, 1\}$

35) $f(x) = x^3 + 5x^2 - 6x - 24$

Possible rational zeros:
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$
Rational zeros: $\{-2\}$

36) $f(x) = 5x^3 - 11x^2 + 7x - 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{5}$
Rational zeros: $\left\{\frac{1}{5}, 1 \text{ mult. } 2\right\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{2}$
Rational zeros: $\left\{-\frac{1}{2}, 1 \text{ mult. } 2\right\}$

38) $f(x) = 3x^3 + 35x^2 - 4$

Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}$
Rational zeros: $\left\{\frac{1}{3}\right\}$

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

Possible rational zeros: $\pm 1, \pm 2$
Rational zeros: $\{-2, 1 \text{ mult. } 2\}$

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

Possible rational zeros: $\pm 1, \pm 2, \pm \frac{1}{2}$
Rational zeros: $\left\{1, 2, \frac{1}{2}\right\}$

41) $f(x) = 4x^3 - 27x + 5$

Possible rational zeros:

$\pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}, \pm \frac{1}{4}, \pm \frac{5}{4}$

Rational zeros: $\left\{\frac{5}{2}\right\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{2}$

Rational zeros: $\left\{\frac{1}{2}, -1 \text{ mult. } 2\right\}$

43) $f(x) = x^3 - 4x^2 - 5x + 14$

Possible rational zeros: $\pm 1, \pm 2, \pm 7, \pm 14$
Rational zeros: $\{-2\}$

44) $f(x) = 5x^3 + 19x^2 - 29x + 5$

Possible rational zeros: $\pm 1, \pm 5, \pm \frac{1}{5}$

Rational zeros: $\left\{\frac{1}{5}, 1, -5\right\}$

45) $f(x) = 2x^3 - 3x^2 - 26x + 3$

Possible rational zeros: $\pm 1, \pm 3, \pm \frac{1}{2}, \pm \frac{3}{2}$

Rational zeros: $\{-3\}$

46) $f(x) = 2x^3 - 12x^2 + 23x - 14$

Possible rational zeros:

$\pm 1, \pm 2, \pm 7, \pm 14, \pm \frac{1}{2}, \pm \frac{7}{2}$

Rational zeros: $\{2\}$

47) $f(x) = 2x^3 + 27x^2 + 57x + 5$

Possible rational zeros: $\pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}$

Rational zeros: $\left\{-\frac{5}{2}\right\}$

48) $f(x) = 2x^3 - 14x^2 + 29x - 18$

Possible rational zeros:

$\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{9}{2}$

Rational zeros: $\{2\}$

49) $f(x) = 2x^3 + 4x^2 - 9x - 14$

Possible rational zeros:

$\pm 1, \pm 2, \pm 7, \pm 14, \pm \frac{1}{2}, \pm \frac{7}{2}$

Rational zeros: $\{2\}$

50) $f(x) = 6x^3 + 32x^2 + 31x + 7$

Possible rational zeros:

$\pm 1, \pm 7, \pm \frac{1}{2}, \pm \frac{7}{2}, \pm \frac{1}{3}, \pm \frac{7}{3}, \pm \frac{1}{6}, \pm \frac{7}{6}$

Rational zeros: $\left\{-\frac{1}{3}\right\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{3}$

Rational zeros: $\left\{1, -1, -\frac{1}{3}\right\}$

52) $f(x) = 3x^3 - 11x^2 - 22x - 6$

Possible rational zeros:

$\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{3}, \pm \frac{2}{3}$

Rational zeros: $\left\{-\frac{1}{3}\right\}$

53) $f(x) = 3x^3 - 23x^2 + 49x - 45$

Possible rational zeros:

$\pm 1, \pm 3, \pm 5, \pm 9, \pm 15, \pm 45, \pm \frac{1}{3}, \pm \frac{5}{3}$

Rational zeros: $\{5\}$

54) $f(x) = 3x^3 + 5x^2 + x - 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{3}$

Rational zeros: $\left\{-1 \text{ mult. } 2, \frac{1}{3}\right\}$

55) $f(x) = 3x^3 + 7x^2 + 5x + 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{3}$

Rational zeros: $\left\{-\frac{1}{3}, -1 \text{ mult. } 2\right\}$

56) $f(x) = x^3 + 2x^2 - 32x - 15$

Possible rational zeros: $\pm 1, \pm 3, \pm 5, \pm 15$
Rational zeros: $\{5\}$

57) $f(x) = x^3 + 14x^2 + 29x + 10$

Possible rational zeros: $\pm 1, \pm 2, \pm 5, \pm 10$
Rational zeros: $\{-2\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{2}$

Rational zeros: $\left\{-1, \frac{1}{2}, 1\right\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{2}$

Rational zeros: $\left\{1, -\frac{1}{2}, -1\right\}$

60) $f(x) = 2x^3 + 5x^2 + 4x + 1$

Possible rational zeros: $\pm 1, \pm \frac{1}{2}$

Rational zeros: $\left\{-1 \text{ mult. } 2, -\frac{1}{2}\right\}$