Secondary Math 3

Name Key

Final Review

Date_____ Period____

Find the remainder.

1) $(x^3 + 9x^2 + 9x - 7) \div (x + 2)$

3

2) $(a^3 + 2a^2 - 40a + 17) \div (a - 5)$

-8

State if the factor is a root of the polynomial. If so, write as a product of two factors.

3) $(6x^3 + 17x^2 + 13x + 6) \div (x + 2)$

$(x+2)(6x^2+5x+3)$

4) $(10x^3 + 100x^2 + 85x - 44) \div (x + 9)$

Not a root

State the possible rational zeros for each function.

5) $f(x) = 6x^3 + 10x^2 + 29x - 11$

$\pm 1, \pm 11, \pm \frac{1}{2}, \pm \frac{11}{2}, \pm \frac{1}{3}, \pm \frac{11}{3}, \pm \frac{1}{6}, \pm \frac{11}{6}$

6) $f(x) = 4x^3 - 8x^2 + 5x - 1$

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

Write a polynomial function of least degree with integral coefficients that has the given zeros.

7) $4, \ 1, \ -\frac{1}{4}$

$f(x) = 4x^3 - 19x^2 + 11x + 4$

8) $-2i, \ -2 - i$

$f(x) = x^4 + 4x^3 + 9x^2 + 16x + 20$

9) $-\frac{2}{5}, \ 3 + 2\sqrt{2}$

$f(x) = 5x^3 - 28x^2 - 7x + 2$

10) $0, \ 1 + 2\sqrt{2}, \ 1 - 2\sqrt{2}$

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

Find all zeros.

11) $f(x) = 5x^4 + 6x^3 + x^2$

$x = 0$ mult. $2, -1, -\frac{1}{5}$

12) $f(x) = 2x^4 + x^2 - 36$

$x = 2, -2, \pm \frac{3i\sqrt{2}}{2}$

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

$x = 0, \frac{3}{2}, -2$

14) $f(x) = 5x^4 - 18x^2 - 8$

$x = 2, -2, \pm \frac{i\sqrt{10}}{5}$

Simplify each and state the excluded values.

15) $\frac{81x}{81x^2}$

$\frac{1}{x}, x \neq 0$

16) $\frac{16a^4}{16a^3}$

$a, a \neq 0$

17) $\dfrac{5x^2 - 39x + 54}{x - 6}$

$5x - 9,\ x \neq 6$

18) $\dfrac{x + 3}{9x + 27}$

$\dfrac{1}{9},\ x \neq -3$

19) $(x + 6) \cdot \dfrac{5x + 3}{5x^2 - 2x - 3}$

$\dfrac{x+6}{x-1},\ x \neq 1, -\dfrac{3}{5}$

20) $\dfrac{5n^2 + 40n + 60}{5n + 10} \div (n^2 + 6n - 7)$

$\dfrac{n+6}{(n-1)(n+7)},\ n \neq -2, 1, -7$

Simplify each expression.

21) $\dfrac{\frac{16}{x^2}}{\frac{x^2}{16}}$

$\dfrac{256}{x^4}$

22) $\dfrac{\frac{9}{4}}{\frac{9}{a^2}}$

$\dfrac{a^2}{4}$

23) $\dfrac{6x}{2x} - \dfrac{x + 2}{9x + 9}$

$\dfrac{26x + 25}{9(x+1)}$

24) $5 + \dfrac{m + 1}{m^2 + 3m - 4}$

$\dfrac{5m^2 + 16m - 19}{(m-1)(m+4)}$

25) $\frac{5k}{6k^3} + \frac{6}{2k^2 + 14k + 20}$

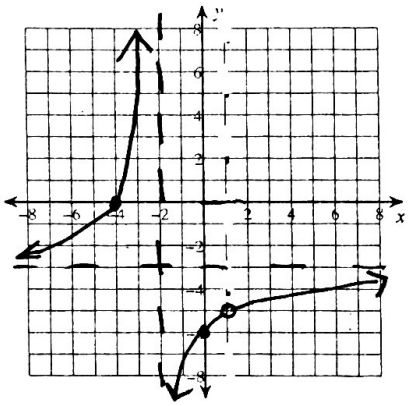
$\frac{25k^2 + 35k + 50}{6k^2(k+5)(k+2)}$

26) $\frac{b - 4}{5b^2 - 34b + 24} + \frac{4b}{2}$

$\frac{10b^3 - 68b^2 + 49b - 4}{(b-6)(5b-4)}$

Find the given information. Then graph the function.

27) $f(x) = \frac{-3x^2 - 9x + 12}{x^2 + x - 2}$



28) # of Discontinuities: 2

Domain: $x \neq -2, 1$

Vertical Asymptotes: $x = -2$

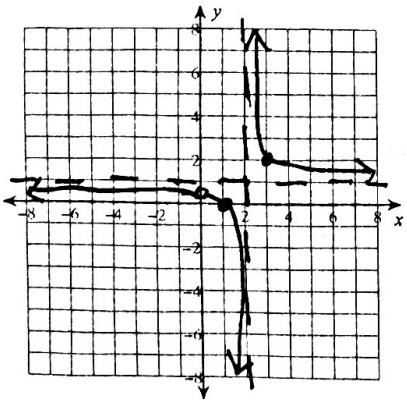
Holes: $(1, -5)$

Horizontal Asymptotes: $y = -3$

x-intercepts: $(-4, 0)$

y-intercepts: $(0, -6)$

29) $f(x) = \frac{x^2 - x}{x^2 - 2x}$



30) # of Discontinuities: 2

Domain: $x \neq 2, 0$

Vertical Asymptotes: $x = 2$

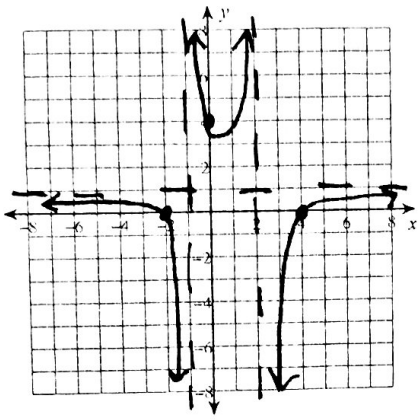
Holes: $(0, \frac{1}{2})$

Horizontal Asymptotes: $y = 1$

x-intercepts: $(1, 0)$

y-intercepts: $(0, \frac{1}{2})$

31) $f(x) = \dfrac{x^2 - 2x - 8}{x^2 - x - 2}$



32) # of Discontinuities: 2

Domain: $x \neq 2, -1$

Vertical Asymptotes: $x = 2$, $x = -1$

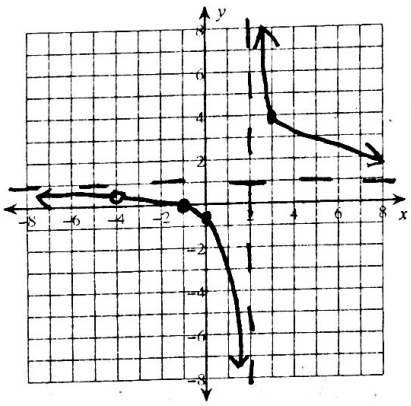
Holes: None

Horizontal Asymptotes: $y = 1$

x-intercepts: $(4,0)$, $(-2,0)$

y-intercepts: $(0,4)$

33) $f(x) = \dfrac{x^2 + 5x + 4}{x^2 + 2x - 8}$



34) # of Discontinuities: 2

Domain: $x \neq -4, 2$

Vertical Asymptotes: $x = 2$

Holes: $(-4, \frac{1}{2})$

Horizontal Asymptotes: $y = 1$

x-intercepts: $(-1,0)$

y-intercepts: $(0, -\frac{1}{2})$

State the domain and solve each rational equation.

35) $\dfrac{k+6}{4k} = \dfrac{1}{4k} - \dfrac{1}{4}$

$k \neq 0$, $k = \dfrac{-5}{2}$

36) $\dfrac{1}{x} + \dfrac{x+4}{3x} = \dfrac{2x-6}{x}$

$x \neq 0$, $x = 5$

37) $\frac{1}{3b-6} - \frac{5}{3} = \frac{1}{b-2}$

$b \neq 2, \ b = \frac{8}{5}$

38) $\frac{1}{3b-6} - \frac{b+2}{3b-6} = \frac{1}{b-2}$

$b \neq 2, \ b = 0$

39) $-3\sqrt[3]{24} - 2\sqrt[3]{6} - \sqrt[3]{3}$

$-7\sqrt[3]{3} - 2\sqrt[3]{6}$

40) $-\sqrt{27} - \sqrt{18} - 3\sqrt{2}$

$-3\sqrt{3} - 6\sqrt{2}$

Simplify.

41) $(3\sqrt{3} + \sqrt{5})(3\sqrt{3} + 4\sqrt{5})$

$47 + 15\sqrt{15}$

42) $(-\sqrt{5} + 2\sqrt{2})(-5\sqrt{5} + 3\sqrt{2})$

$37 - 13\sqrt{10}$

43) $\frac{9 - 9\sqrt{3}}{3 - \sqrt{2}}$

$\frac{27 + 9\sqrt{2} - 27\sqrt{3} - 9\sqrt{6}}{7}$

44) $\frac{5\sqrt{10} - \sqrt{2}}{-7 + \sqrt{6}}$

$\frac{-35\sqrt{10} - 10\sqrt{15} + 7\sqrt{2} + 2\sqrt{3}}{43}$

45) $\frac{4 + \sqrt{3}}{9 - \sqrt{6}}$

$\frac{36 + 4\sqrt{6} + 9\sqrt{3} + 3\sqrt{2}}{75}$

46) $\frac{3 + \sqrt{10}}{-1 + 10\sqrt{6}}$

$\frac{3 + 30\sqrt{6} + \sqrt{10} + 20\sqrt{15}}{599}$

Write the equation of the graph that meets each criteria:

47) Parent function: $y = x^3$
Reflected about the x axis.
A vertical compression by a factor of .5
A vertical translation of 7 units up.
A horizontal translation of 2 units left.

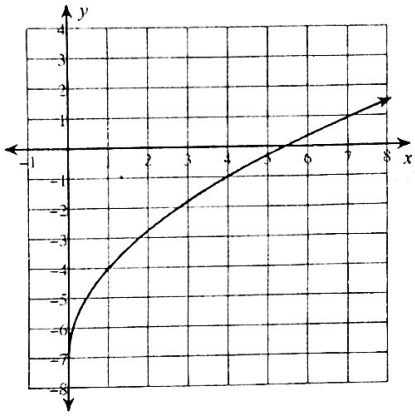
$y = -0.5(x+2)^3 + 7$

48) Parent function: $y = \sqrt{x}$
A vertical stretch by a factor of 2.
A reflection across the x axis.
A ~~vertical~~ horizontal translation of 2 units right.

$y = -2\sqrt{x-2}$

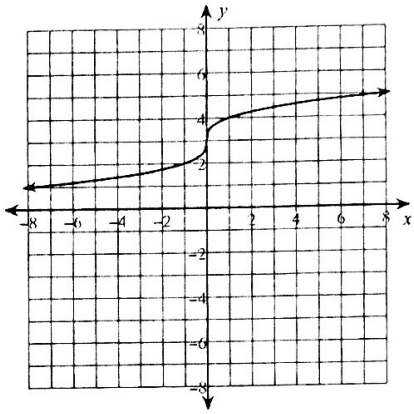
Write the equation of each function below:

49)



$y = 3\sqrt{x} - 7$

50)



$y = \sqrt[3]{x} + 3$

Find the inverse of each function.

51) $f(n) = \dfrac{-2 + \sqrt[5]{16n}}{2}$

$f^{-1}(n) = 2(n+1)^5$

52) $g(n) = -n^3 + 2$

$g^{-1}(n) = \sqrt[3]{-n+2}$

53) $f(x) = -\dfrac{1}{x} + 2$

$f^{-1}(x) = -\dfrac{1}{x-2}$

54) $f(x) = 5 - \dfrac{7}{4}x$

$f^{-1}(x) = -\dfrac{4}{7}x + \dfrac{20}{7}$

Find the amount in each account given that it is compounded annually.

55) principal: $400
annual interest rate: 3.7%
time: 12 years

$618.59

56) principal: $750
annual interest rate: 4.2%
time: 18 years

$1,572.82

57) The value of a car decreases by 8% each year. If you purchased the car for $20,000, what would the car be worth after 6 years?

$12,127.10

58) You have $650 that you can put into a savings account that accrues 3.5% annual interest. You want to save $1200. How long will it take for your account to reach this amount?

About 18 years

Find the amount in a continuously compounded account for the given conditions.

59) principal: $2000
annual interest rate: 3.1%
time: 5 years

$2,335.32

60) principal: $600
annual interest rate: 2.6%
time: 4.5 years

$674.47

61) A student wants to save $10,000 for college in 6 years. How much should be put into an account that pays 4.2% annual interest compounded continuously?

$7,772.45

62) A man wants to save 1 million dollars for his retirement fun over a period of 35 years. If he makes no additional deposits, how much should be put into an account that pays 2.7% annual interest compounded continuously?

$388,679.57

Evaluate each expression.

63) $\log_7 49$

2

64) $\log_7 \frac{1}{343}$

-3

65) $\ln e$

1

66) $\log_{16} 2$

$\frac{1}{4}$

Expand each logarithm.

67) $\log_4 (a^3 \cdot b)^5$

$15\log_4 a + 5\log_4 b$

68) $\log_3 (z^2\sqrt{x})$

$2\log_3 z + \frac{1}{2}\log_3 x$

69) $\log_7 \left(\frac{x^6}{y}\right)^4$

$24\log_7 x - 4\log_7 y$

70) $\log_2 \frac{x^2}{y^4}$

$2\log_2 x - 4\log_2 y$

Solve each equation.

71) $625^{-3x} = 125^{3x}$

$x = 0$

72) $243^{-2x-2} = 27^{2x}$

$x = \frac{-5}{8}$

Solve each equation. Write final answers using log base 10.

73) $5^{5x} - 1 = 46$

$x = \frac{\frac{\log 47}{\log 5}}{5}$

or

$x = \frac{\log 47}{5\log 5}$

74) $20^{b+3} - 4 = 34$

$b = \frac{\log 38}{\log 20} - 3$

Find a positive and a negative coterminal angle for each given angle.

75) $-18°$

$342°, -378°$

76) $15°$

$375°, -345°$

Find a coterminal angle between 0° and 360°.

77) $-495°$

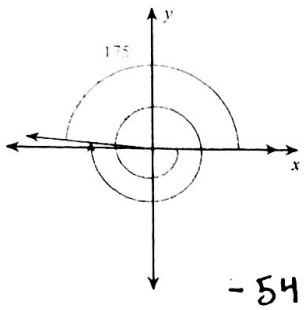
$225°$

78) $370°$

$10°$

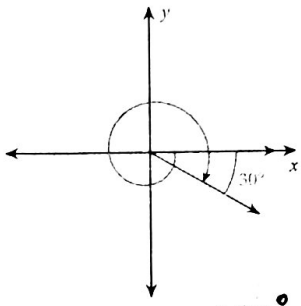
Find the measure of each angle.

79)



$-545°$

80)



$-390°$

Find the exact value of each trigonometric function.

81) $\cos -150°$ $\quad -\frac{\sqrt{3}}{2}$

82) $\cos 300°$ $\quad \frac{1}{2}$

83) $\tan 0°$ $\quad 0$

84) $\tan -150°$ $\quad \frac{\sqrt{3}}{3}$

85) $\tan 0$ $\quad 0$

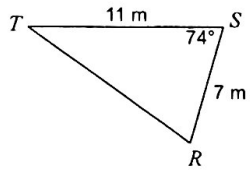
86) $\cos \pi$ $\quad -1$

87) $\sin \frac{5\pi}{6}$ $\quad \frac{1}{2}$

88) $\cos \frac{\pi}{3}$ $\quad \frac{1}{2}$

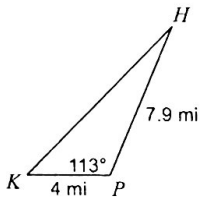
Find the area of each triangle to the nearest tenth.

89)



$37.0\ m^2$

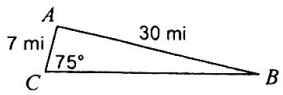
90)



$14.5\ mi^2$

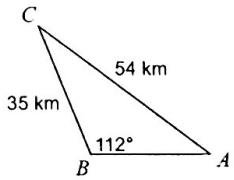
Find each measurement indicated. Round your answers to the nearest tenth.

91) Find $m\angle B$



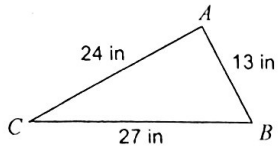
$13.0°$

92) Find $m\angle A$



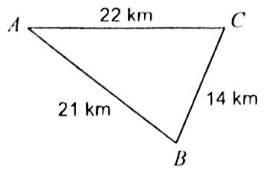
$36.9°$

93) Find $m\angle B$



62.7°

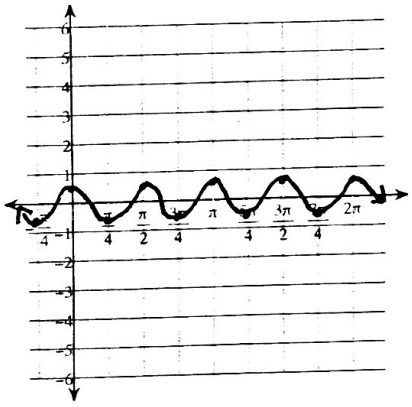
94) Find $m\angle C$



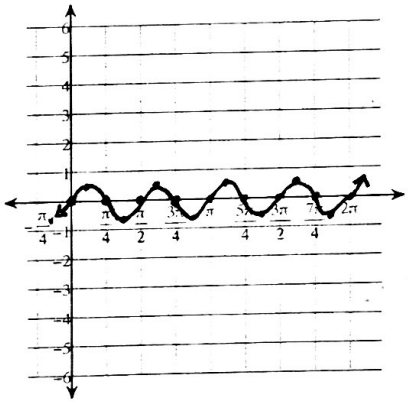
67.2°

Graph each function using radians. Then state the domain and range.

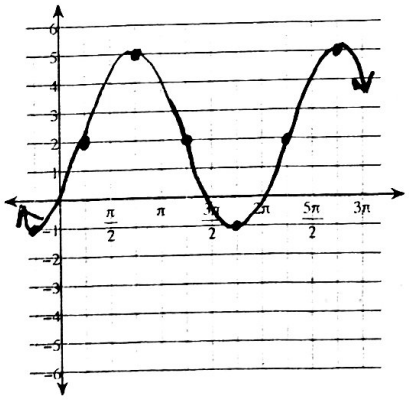
95) $y = \frac{1}{2} \cdot \cos 4\theta$



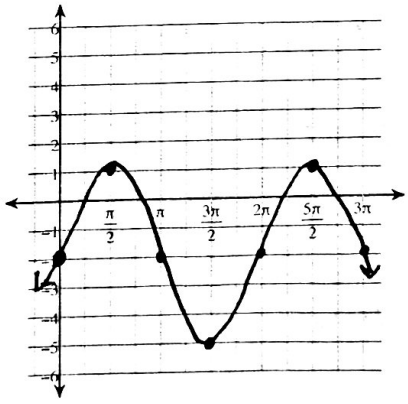
96) $y = \frac{1}{2} \cdot \sin 4\theta$



97) $y = 3\sin\left(\theta - \frac{\pi}{4}\right) + 2$



98) $y = 3\cos\left(\theta + \frac{3\pi}{2}\right) - 2$



For each sequence, state if it is arithmetic, geometric, or neither.

99) $\frac{3}{4}, \frac{3}{8}, \frac{3}{16}, \frac{3}{32}, \frac{3}{64}, \ldots$

Geometric

100) $-3, -\frac{9}{4}, -\frac{9}{5}, -\frac{3}{2}, -\frac{9}{7}, \ldots$

Neither

101) 39, 42, 45, 48, 51, ...

Arithmetic

102) $-\frac{13}{9}, -\frac{7}{9}, -\frac{1}{9}, \frac{5}{9}, \frac{11}{9}, \ldots$

Arithmetic

Evaluate each series.

103) $\sum_{k=1}^{6} (30 - k^2)$ 89

104) $\sum_{n=1}^{6} (40 - n)$ 219

105) $\sum_{n=1}^{7} n(n-2)$ 84

106) $\sum_{k=1}^{5} (2k^2 - 3)$ 95

Evaluate each arithmetic series described.

107) $11 + 17 + 23 + 29\ldots,\ n = 13$

611

108) $28 + 38 + 48 + 58\ldots,\ n = 15$

1470

Evaluate each geometric series described.

109) $-1 - 3 - 9 - 27\ldots,\ n = 9$

-9841

110) $-3 + 6 - 12 + 24\ldots,\ n = 9$

-513

Determine if each geometric series converges or diverges. If it converges, find the sum.

111) $3 + 9 + 27 + 81\ldots$

Diverges

112) $5 - 1 + \frac{1}{5} - \frac{1}{25}\ldots$

Converges, $\frac{25}{6}$

113) $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8}\ldots$

Converges, $\frac{2}{3}$

114) $3 - 6 + 12 - 24\ldots$

Diverges

Find the explicit formula.

115) 15, 5, −5, −15, ...

$15 - 10(n-1)$

116) 3, −197, −397, −597, ...

$3 - 200(n-1)$

117) −4, −20, −100, −500, ...

$-4(5)^{n-1}$

118) 2, −8, 32, −128, ...

$2(-4)^{n-1}$