

MATH 1113 Final Review

Fall 2019



Simplify an expression.

1. $5x + 1 - [3(x - 2) - 4]$
2. $|-5|x + \frac{2x}{x-4} - [2(x^2 - 3) - 4]$

Factoring.

3. $x^3 - 5x^2 + 3x - 15$
4. $x^2 + 7x + 12$
5. $2x^2 - 8x - 10$

Solve.

6. $x^2 - 2x + 1 = 0$
7. $x^3 - 2x^2 + 6x - 12 = 0$
8. $x^2 - 5x = 0$

Rationalize the Denominator.

9. $\frac{3}{3+\sqrt{7}}$
10. $\frac{5i}{2+i}$

Distance and Midpoint.

11. Find the distance between: (2, 3) and (-1, 2)
12. Find the midpoint between: (2, 3) and (-1, 2)
13. Find the distance between: (1, 4) and (3, 2)
14. Find the midpoint between: (1, 4) and (3, 2)

Describe the shift and sketch the graph.

15. $y = -|x + 1|$
16. $y = (x - 1)^2 + 2$

Functions. Given $f(x) = x^2 - 2x + 1$ and $g(x) = \sqrt{x}$,

17. Find $f(x) + g(x)$
18. Find $f(g(x))$
19. Find $g(f(x))$
20. Find $g(x) - f(x)$

Find the inverse of each function.

21. $f(x) = 3x - 1$
22. $f(x) = \sqrt{x + 1} + 2$

Find the center and radius of the circle.

23. $(x - 1)^2 + (y + 2)^2 = 9$
24. $x^2 + y^2 - 2x + 4y + 1 = 0$

Find the slope.

25. (1, 3) and (4, 7)

Find the equation of a line that goes through the following points.

26. (1, 3) and (4, -2)

27. (1, 2) and (3, 4)

28. (4, -7) and (4, 3)

29. (1, 2) and (6, 2)

Average Rate of Change and Difference Quotient.

30. Find the average rate of change of $f(x) = (3 - x)^2$ from $a = 1$ to $b = 3$

31. Find the difference quotient of $f(x) = -2x + 3$

32. Find the difference quotient of $f(x) = x^2 - x$

Graphs.

33. Given the below graph, find:

a. Domain: _____

b. Range: _____

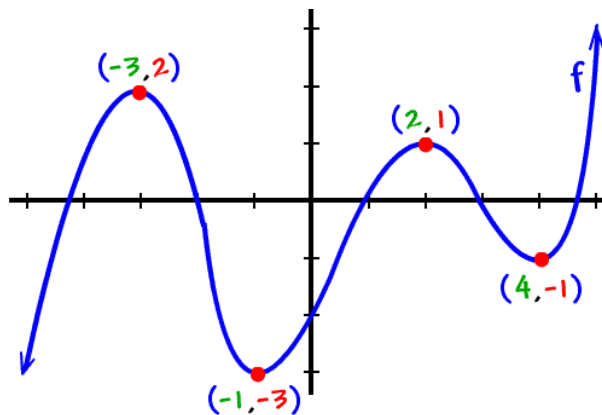
c. Increasing: _____

d. Decreasing: _____

e. Relative Maximum: _____

f. Relative Minimum: _____

g. Turning Points: _____



Find the degree, leading term and leading coefficient:

34. $f(x) = 5x^3 + 2x + 9$

Find the behavior, zeros (x-intercepts), multiplicity, where it crosses/touches, y-intercept, the number line to find when the function is above or below x-axis, and sketch.

35. $f(x) = x^3(x + 1)(x - 1)$

$$36. f(x) = -(x-1)^2(x)(x+1)$$

Find the vertex (know using standard form and formula).

$$37. f(x) = 2x^2 - 8x + 9$$

$$38. f(x) = x^2 - 4x + 5$$

Long division.

$$39. (x^3 + 3x^2 + 3x + 1) \div (x^2 + 2x + 1)$$

Synthetic division.

$$40. (x^3 - 3x^2 + 3x - 1) \div (x - 1)$$

$$41. \frac{3x^4 - 6x^2 + 3x - 7}{x+1}$$

Set of rational zeros.

$$42. f(x) = 2x^4 - 5x^2 - 2x + 1$$

Find the domain, vertical asymptotes and horizontal asymptotes.

$$43. f(x) = \frac{2x^2 - 2}{x^2 + 2x - 3}$$

$$44. y = \frac{x^2 + 2x + 1}{x + 2}$$

$$45. y = \frac{x}{x^2}$$

Simple and Compound Interest.

46. Find the simple interest for $P = \$5,000$, $r = 15\%$, $t = 6$ years.

47. Find the future value of $P = \$6,500$ at 9.5% compounded quarterly for 12 years.

Graph.

$$48. f(x) = 2^x$$

$$49. f(x) = \frac{1}{2}^x$$

Evaluate.

$$50. \log_3\left(\frac{1}{3}\right)$$

$$51. \log_2(8)$$

$$52. \ln(e^3)$$

Condense.

$$53. \frac{1}{3}(\log x - 2 \log y + 3 \log z)$$

$$54. \log x + \log(x^2 + 5) - \log(x - 3) - \log(x^2 + 2)$$

$$55. 2 \log x + 3 \log y - \log z$$

$$56. \log(x^2) - 6 \log(z)$$

Expand.

$$57. \ln \frac{x-2}{x+3}$$

$$58. \ln \frac{x(x-1)}{(x+1)^2}$$

$$59. \ln \frac{x^2 y}{z^3}$$

Solve.

60. $x = \ln \sqrt{e}$

61. $2^{x-2} = 16$

62. $2^{x+1} = 8^{x-1}$

63. $5^{2x+1} = 3^{x-1}$

64. $\log_2(x) + \log_2(x+2) = 3$

65. $\log(x^2 - x - 5) = 0$

66. $2^{2x} - 4 \cdot 2^x = 21$

67. $e^{2x-1} = 5$

Evaluate.

68. $\sin\left(\frac{4\pi}{3}\right)$

69. $\cos(135^\circ)$

70. $\tan\left(\frac{\pi}{2}\right)$

71. $\cot\left(\frac{7\pi}{4}\right)$

72. $\sec(\pi)$

73. $\csc(30^\circ)$

Find the six trigonometric values.

74. Given the point $(-1, -2)$ on the terminal side of an angle.

75. Given $P(t) = \left(\frac{1}{2}, \frac{\sqrt{3}}{3}\right)$ is on the unit circle.

Given $\cot(\theta) = -\frac{1}{3}$ and θ is in quadrant II,

76. Find $\sin(\theta)$

77. Find $\cos(\theta)$

Sketch (Label Key Points).

78. $y = 2 \sin(x) + 3$

79. $y = \tan(x)$

Given $y = -6 \cos\left[\frac{1}{2}(x+2)\right]$

80. Find the amplitude

81. Find the period

82. Find the phase shift

Evaluate.

83. $\sin^{-1}\left(-\frac{1}{2}\right)$

84. $\cos^{-1}(-1)$

Find the inverse.

85. $f(x) = \tan(x - 1) + 2$

Simplify using product-to-sum formulas.

86. $\cos(64^\circ)\cos(4^\circ)$

Find the exact value.

87. $\cos(105^\circ)\sin(75^\circ)$

88. $\sin(41^\circ)\cos(49^\circ) + \cos(41^\circ)\sin(49^\circ)$

89. $2\sin(75^\circ)\cos(75^\circ)$

90. $\frac{2\tan(15^\circ)}{1-\tan^2(15^\circ)}$

Verify.

91. $(\cos x + 1)(\cos x - 1) = \frac{1}{\csc^2 x}$

92. $\sin x \tan x + \cos x = \tan x \csc x$

Find all the solutions on the interval $[0, 2\pi)$

93. $\cos 2x = \frac{\sqrt{3}}{2}$

94. $\sin\left(2x - \frac{\pi}{3}\right) = \frac{1}{2}$

95. $4\sin^2 x = 1$

96. $(\tan x + 1)(2\sin x - 1) = 0$

Solve the system of equation.

97. $\begin{cases} 2x + y = 9 \\ 2x - 4y = 5 \end{cases}$

98. $\begin{cases} x = 3y + 4 \\ x = 5y + 10 \end{cases}$

99. $\begin{cases} 2x - y = 5 \\ -4x + 2y = 7 \end{cases}$

100. $\begin{cases} 3x + 5y = 7 \\ 6x + 10y = 14 \end{cases}$