

**Geometry Placement Exam Review  
Revised 2017  
Maine East High School**

**The actual placement exam has 91 questions.**

**The placement exam is free response—students must solve questions and write answer in space provided.**

**No calculator is allowed—everything is pencil and paper.**

**Quadratic Equations and Factoring—25 questions**

**Polynomials and Polynomial Functions—23 questions**

**Rational Exponents and Radical Functions—15 questions**

**Exponential and Logarithmic Functions—21 questions**

**Rational Functions—7 questions**

- 1) **SKIP**
- 2) **SKIP**
- 3) **SKIP**
- 4) **SKIP**
- 5) **SKIP**
- 6) **SKIP**
- 7) **SKIP**
- 8) **SKIP**
- 9) **SKIP**
- 10) **SKIP**

11) Identify the **vertex of the parabola**  $y = -\frac{1}{2}(x+3)^2 + 4$

12) Identify the **vertex of the parabola**  $y = 2(x-3)(x+1)$

13) Identify the **vertex of the parabola**  $y = x^2 - 6x + 11$

14) Write the quadratic function  $y = -(x+4)(x-9)$  in **standard form**.

15) Write the quadratic function  $y = \frac{1}{2}(x+2)^2 - 3$  in **standard form**.

16) **Solve:**  $8x^2 + 18x + 9 = 0$  by **factoring**.

17) **Solve:**  $\frac{1}{3}(x+5)^2 + 2 = 9$  by **extracting square roots**.

18) **Solve:**  $2x^2 + x = 5$  by using the **quadratic formula**.

19) Given  $x^2 - 8x + c$

A) Find the value of  $c$  that makes the expression a perfect square trinomial.

B) Then write the expression as the square of a binomial.

20) Find the zeros of  $f(x) = 4x^2 - 4x - 3$

21) Plot  $(-3 + 2i)$  in the complex plane.

22) Find the absolute value of  $(-2 - i)$

23) Simplify  $(4 + 3i) - (-2 + 4i)$

24) Simplify  $4i(6 - i)$

25) Simplify  $(-1 + 2i)(11 - i)$

26) Simplify  $\frac{3i}{(1+i)}$

27) Simplify  $\frac{5+3i}{1-2i}$

28) Simplify  $4\sqrt{-5} + 3\sqrt{-125}$

29) Complete the square in order to convert  $y = x^2 - 8x + 11$  into vertex form.

30) Complete the square in order to convert  $y = 2x^2 + 6x + 7$  into vertex form.

31) Evaluate the discriminant of the following and then describe solutions (real/nonreal, different/same)

A)  $x^2 - 4x + 10 = 0$

B)  $x^2 + 3x - 6 = 0$

C)  $x^2 + 14x + 49 = 0$

32) When an object is dropped, the model  $h(t) = -16t^2 + h_0$  describes the height (feet) of the object as a function of time (seconds). The initial height is represented by  $h_0$ .

If an object is dropped from a height of 320 feet, **in how many seconds will it hit the ground?**

33) Use the quadratic formula to solve  $-x^2 + 2x = 2$ .

34) Solve the quadratic inequality  $x^2 - 6x + 5 \leq 0$

35) Solve the quadratic inequality  $2x^2 - 7x + 3 \geq 0$

36) **Write a quadratic function in vertex form** given vertex  $(-1, 4)$  and point  $(-2, 2)$

37) **Write a quadratic function in intercept form** given  $x$ -intercepts  $-2$  &  $1$  and point  $(-1, -6)$

38) **Write a quadratic form in standard form** given points  $(0, -4)$ ,  $(-1, -5)$ ,  $(2, 10)$

39) Expand  $(x + y)^2$

40) Factor completely:  $x^2 - 12x - 28$

41) Factor completely:  $4x^2 - 4x - 3$

42) Factor completely:  $9x^2 + 24x + 16$

43) Factor completely:  $6x^2 + 15x + 9$

44) Factor completely:  $2x^2 + 54$

45) Factor completely:  $x^3 - 1$

46) Factor completely:  $-2x^3 - 4x^2 - 3x - 6$

47) Factor completely:  $81x^4 - 16$

48) Evaluate  $2^{10}$  (hint: use fingers and count to 10 as you keep doubling—2, 4, 8, 16, etc.)

49) Simplify  $x^2 \cdot x^{-2}$

50) Evaluate  $-2^2$

51) Evaluate  $(-2)^2$

52) Evaluate  $2^{-2}$

53) Evaluate  $(-5)^{-6}(-5)^4$

54) Evaluate  $-4^{-2} + \frac{1}{3^{-2}}$

55) Evaluate  $(2^3)^2$

56) Evaluate  $\left(\frac{2}{3}\right)^{-4}$

57) Simplify  $(-3x)^3$

58) Simplify  $\left(\frac{xy^9}{20x^2y^{-2}}\right)\left(\frac{-7y}{21x^5}\right)$

59) Simplify  $\frac{(m^4 w)^2}{m^0 + w^0}$

60) Subtract  $(8x^3 - 3x^2 - 2x + 9) - (6x^2 - x + 1)$

61) Multiply  $(x + 5)(5x^2 + 3x - 1)$

62) Multiply  $(x - 2)(x - 1)(x + 3)$

63) Solve  $3x^4 + 3x^3 - 6x^2 - 6x = 0$

64) Divide  $(x^3 - 3x^2 - 7x + 6)$  by  $(x - 4)$

65) Divide  $(x^3 - 3x^2 - 7x + 6)$  by  $(x + 2)$

66) Factor  $f(x) = 3x^3 + 13x^2 + 2x - 8$  given that  $f(-4) = 0$



67) List all the possible rational zeros of  $f(x) = 4x^3 + 5x^2 - 3$

68) State the degree of the following polynomial:  $f(x) = 2(x+3)(x-2)^3(x+1)^2$

69) A third degree polynomial function has zeros of 3 and  $(2-4i)$ .  
List the other zero.

70) **Write a polynomial function of least degree** that has a lead coefficient of 1, real coefficients, and zeros of 4 and  $5i$ .

71) Graph the polynomial function  $f(x) = \frac{1}{12}(x+4)(x+1)^2(x-3)$

72) The graph of a cubic polynomial function has  $x$ -intercepts of  $-3$ ,  $2$ , and  $5$ .  
The graph also passes through the point  $(0, -15)$ .  
Write the cubic polynomial function in intercept form.

73) Simplify  $9^{3/2}$

74) Simplify  $32^{-2/5}$

75) Simplify  $5^{1/2} \cdot 5^{1/4}$

76) Simplify  $\sqrt[3]{54}$

77) Simplify  $\sqrt[5]{\frac{3}{4}}$

78) Simplify  $\sqrt[3]{125y^6}$  (assume all variables are positive)

79) Simplify  $\sqrt[5]{5a^5b^9c^{13}}$  (assume all variables are positive)

80) Simplify  $3\sqrt[3]{5x^5} - x\sqrt[3]{40x^2}$  (assume all variables are positive)

81) Simplify  $\sqrt{8} + \sqrt{75} + \sqrt{50}$

82) Expand  $(2 + \sqrt{3})^2$

83) Expand  $(2 - \sqrt{3})(3 + 2\sqrt{2})$

84) Simplify  $\frac{1}{\sqrt{2}}$

85) Simplify  $\frac{3}{2 + \sqrt{5}}$

86) Let  $f(x) = x^2 - 1$     $g(x) = 3x$

A) Find  $f(g(x))$

B) Find  $g(f(x))$

87) If  $f(x) = \frac{1}{6}x^5 + \frac{2}{3}$ , find  $f^{-1}(x)$ .

88) Solve  $\sqrt[3]{x} - 4 = 0$

89) Solve  $2x^{3/2} = 250$

90) Solve  $\sqrt{4x-7} + 2 = 5$

91) Solve  $\sqrt{3x+2} - 2\sqrt{x} = 0$

92) Solve  $x - 4 = \sqrt{2x}$

93) Simplify and write in radical form:  $5x^{1/2}y^{5/3}$  (assume all variables are positive)

94) Simplify and write using rational exponents:  $\sqrt[3]{27x^4y^2}$  (assume all variables are positive)

95) State the domain and range of  $y = \ln(x-2) + 5$

96) State the domain and range of  $y = 3^{x-2} + 1$

97) A town has a population of 75,000 and the population increases 2% every year.  
Write an **exponential growth model**.

98) You purchase a car for \$25,000 and the value decreases 15% every year.  
Write an **exponential decay model**.

99) **Just set up the equation for the following—do not evaluate.**  
You deposit \$500 in a bank that pays 0.8% annual interest, compounded quarterly.  
How much money will you have in 10 years?

100) **Just set up the equation for the following—do not evaluate.**  
You deposit \$1000 in a bank that pays 2.5% annual interest, compounded continuously.  
How much money will you have in 20 years?

101) **Simplify**  $\sqrt{\frac{4(27e^{13}x)}{3e^7x^{-3}}}$

102) **Evaluate**  $\log_2(64)$

103) **Evaluate**  $\log_9 27$

104) **Simplify**  $\log_5 125^x$

105) Find the **inverse** of  $y = e^{x+2} - 5$

106) Use  $\log_5(2) \approx 0.4$  and  $\log_5(3) \approx 0.7$  to **approximate**  $\log_5\left(\frac{3}{2}\right)$ .

107) **Condense**  $\ln 40 + 2\ln \frac{1}{2} + \ln x$

108) **Expand**  $\log_4\left(\frac{x^2}{3y}\right)$

109) Use the **change of base formula** to express  $\log_3 7$  in terms of common logarithms.

110) **Solve**  $4^x = \left(\frac{1}{2}\right)^{x-3}$

111) **Solve**  $4\ln(-x) + 3 = 21$

112) **Solve**  $4^x = 11$  and report answer in terms of natural logs.

113) You take soup off the stove at 200 deg F. The kitchen is at 75 deg F.

The cooling rate of the soup is  $r = \frac{0.05^\circ F}{\text{min}}$ .

**In how many minutes** will it take the soup to cool to 100 deg F?

114) Write an **exponential function** whose graph passes through  $(3,18)$  and  $(1,2)$ .

115) Write a **power function** whose graph passes through  $(2,16)$  and  $(1,4)$ .

116) The intensity of light **varies inversely** as the square of the observers distance from the light source.  
The light intensity is 9 lumens when the observer is 10 meters from the light source.  
If the observer is 3 meters from the light source, **what is the light intensity?**

117) State the **domain and range** of  $y = \frac{2}{x+3} - 4$

118) Given  $y = \frac{3x^2 + 10x - 8}{x^2 - 4}$ , find the following:

A) **Vertical Asymptotes**

B) **Horizontal Asymptote**



119) Given  $y = \frac{x^2 - 2x - 3}{x - 4}$ , find the following:

A) **Vertical Asymptote**

B) **Slant Asymptote**

120) **Simplify**  $\frac{x^2 - x - 12}{8x^2} \div \frac{x^3 + 3x^2}{8x^3 - 2x^2} \cdot \frac{x + 2}{4x - 1}$

121) **Add**  $\frac{3}{x} + \frac{5}{x - 2}$

122) **Simplify:**  $\frac{\frac{x}{5} + 4}{8 + \frac{1}{x}}$

123) **Solve:**  $\frac{2x}{x - 1} + \frac{1}{x - 3} = \frac{2}{x^2 - 4x + 3}$