INTERMEDIATE ALGEBRA FINAL/MIDTERM EXAM REVIEW

Problem numbers 1-13, 17-25, 36-61, 66-90, 96, 98, 113-115 and 117 are review for the concepts covered on the midterm.

This review represents the topics covered by the final exam. It is in no way intended to represent the quantity of any particular type of problem on the final exam.

Evaluate.

1. $14+(y-5)^2-12\div y$ for $y=-2$

2. $2-5xy+y^2-4xy^3+x^6$ for $x=-1$ and $y=2$

Simplify. All answers should contain only positive exponents. Do not leave rational exponents in your answer. Assume all variables represent nonnegative numbers

3. $\left(-8r^7s^3\right)\left(-2rt^5\right)$

4. $\left(-4y^4\right)^3$

5. $\dfrac{\left(xy^4\right)^3}{x^2y^8}$

6. $5^{10}\cdot 5^{-2}$

7. $\dfrac{4x^{-2}}{y^{-3}z^5}$

8. $\left(2m^2n^{-4}\right)^3$

9. $\left(\dfrac{4x^{-7}}{9y^{-2}z}\right)^0\cdot\left(\dfrac{x^6y^3}{wz^4}\right)^{-5}$

10. $\left(\dfrac{5a^6b^4}{7a^9}\right)^{-2}$

11. $\left(\dfrac{a^8b^{-5}}{5b^{10}a^{-4}}\right)^3$

12. $(a^4b^{-3}c^5)(a^{-3}b^{-3}c^{-8})$

13. $(2a^3b^{-1})^{-4}$

14. $\sqrt{14m^5}\cdot\sqrt{7m^{19}}$

15. $\left(8x^2y^5\right)^{1/2}\cdot\left(2xy^3\right)^{3/2}$

16. $\left(x^3y\right)^{3/2}\cdot 3x^{1/5}y^{3/5}$

17. $\dfrac{6+\dfrac{1}{a^2}}{6-\dfrac{1}{a}}$

18. $\dfrac{x-17+\dfrac{16}{x}}{x-5+\dfrac{4}{x}}$

Perform the indicated operations and simplify. Assume variables can represent any real number.

19. $\dfrac{x-8}{x^2+6x+9}\cdot\dfrac{x^2-5x-24}{x^2-16x+64}$

20. $\dfrac{2y^2+17y+21}{4y^2-2y-12}\cdot\dfrac{6y^2-24}{3y^2+17y-28}$

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21. $\dfrac{z^2+13z+40}{z^2+16z+64} \div \dfrac{z^2+5z}{z^2+3z-40}$

22. $\dfrac{6x^2-7x-20}{25-4x^2} \div \dfrac{16+24x+9x^2}{2x^2+3x-5}$

23. $\dfrac{1}{2x-5} - \dfrac{1}{x+1} + \dfrac{2x-5}{2x^2-3x-5}$

24. $\dfrac{3}{2y+1} - \dfrac{1}{2y-1} + \dfrac{4y}{4y^2-1}$

25. $\dfrac{b}{b^2-25} + \dfrac{5}{b+5} - \dfrac{6}{b}$

26. $\sqrt{18x^5} \cdot \sqrt{6x^{15}}$

27. $\sqrt[5]{x^2(y+z)^3} \cdot \sqrt[5]{x^{23}(y+z)^{39}}$

28. $\dfrac{\sqrt[3]{351a^4z^2}}{\sqrt[3]{13a^2z}}$

29. $\dfrac{\sqrt[4]{128x^{16}y^{32}}}{\sqrt[4]{4xy^{-3}}}$

30. $\dfrac{\sqrt[5]{192a^{16}z^{17}}}{\sqrt[5]{6az^{-2}}}$

31. $\sqrt{5a} - 4\sqrt{80a} - 7\sqrt{45a}$

32. $-6\sqrt{12} - 5\sqrt{147}$

33. $6 \cdot \sqrt[3]{2} - 9\sqrt{8} + 8 \cdot \sqrt[3]{2} + 4\sqrt{8}$

34. $4 \cdot \sqrt[7]{x^8y} - 3x \cdot \sqrt[7]{xy}$

35. $6 \cdot \sqrt[11]{x^{12}y} + 5x \cdot \sqrt[11]{xy}$

Factor completely. If the polynomial is prime, state so.

36. $15x^2+29x+12$

37. $20x^2+7x-6$

38. $10x^2-37x-12$

39. $-75a^2+85a+20$

40. $-24a^2+66a-45$

41. $64a^2-32a-60$

42. $-8x^2-24xy-32y^2$

43. $48x^2-72x+27$

44. $25x^4-11$

45. $(a-5)^2-5(a-5)-24$

46. x^4-r^4

47. $9x^2-36xy-45y^2$

48. $3x^2-10xy-8y^2$

49. $12x^2-4xy-16y^2$

50. $2x^3-18x^2-6x+54$

51. $4x^3-20x^2-x+5$

52. $2x^3-6x^2-4x-12$

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53. $24z^2 - 23z - 12$

54. $12x^3 + 16x^2 - 27x - 36$

55. $6x^3 - 8x^2 - 15x - 20$

56. $(a+7)^2 + 5(a+7) - 6$

57. $u^3 + 216v^3$

58. $y^9 - 27$

59. $27 - (a+1)^3$

60. $(x-2)^3 + (x+2)^3$

61. $64x^2 - 112x + 49$

Rationalize the denominator.

62. $\sqrt{\dfrac{7}{48xy^2}}$

63. $\dfrac{2\sqrt{3} + 13\sqrt{5}}{10\sqrt{5} - 3\sqrt{3}}$

64. $\dfrac{5 - \sqrt{2}}{5 + \sqrt{2}}$

65. $\dfrac{5\sqrt{x}}{\sqrt{x} + 4\sqrt{y}}$

Solve the following application problems.

66. A rectangular space of 390 square feet is allocated for the living and dining areas in an apartment. Find the width of the square living area given that the width of the dining area is 11 ft.

67. A 15-ft ladder is leaning against a building. If the bottom of the ladder is 9 ft from the base of the building, how high does the ladder reach?

68. If an object is thrown upward with an initial velocity of 80 ft/sec, its height after *t* sec is given by $h = 80t - 16t^2$. After how many seconds will the object hit the ground?

69. If an object is propelled upward from a height of 16 feet at an initial velocity of 64 feet per second, then its height after *t* seconds is given by the equation $h = -16t^2 + 64t + 16$, where *h* is in feet. After how many seconds will the object reach a height of 80 feet?

70. On a map of Nature's Wonder Hiking Trails, 1 centimeter corresponds to 5 miles. Find the length of a trail represented by a line that is 112 centimeters long on the map. Write the answer as a mixed number, if necessary.

71. A flagpole casts a shadow of 39 ft. Nearby, a 10-ft tree casts a shadow of 3 ft. What is the height of the flag pole?

72. A vehicle parked on the street that is 6 feet tall casts a shadow 24 feet long. At the same time, a house nearby casts a shadow 72 feet long. Find the height of the house.

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73. A painter can finish painting a house in 6 hours. Her assistant takes 8 hours to finish the same job. How long would it take for them to complete the job if they were working together?

74. One pump can drain a pool in 12 minutes. When a second pump is also used, the pool only takes 2 minutes to drain. How long would it take the second pump to drain the pool if it were the only pump in use?

75. EJ can overhaul a boat's diesel inboard engine in 15 hours. His apprentice takes 30 hours to do the same job. How long would it take them working together assuming no gain or loss inefficiency?

76. A cyclist bikes at a constant speed for 24 miles. He then returns home at the same speed but takes a different route. His return trip takes one hour longer and is 29 miles. Find his speed.

77. A car travels 400 miles on level terrain in the same amount of time it travels 160 miles on mountainous terrain. If the rate of the car is 30 miles per hour less in the mountains than on level ground, find its rate in the mountains.

78. A boat moves 7 kilometers upstream in the same amount of time it moves 17 kilometers downstream. If the rate of the current is 5 kilometers per hour, find the rate of the boat in still water.

79. Jim can run 5 miles per hour on level ground on a still day. One windy day, he runs 14 miles with the wind, and in the same amount of time runs 5 miles against the wind. What is the rate of the wind?

80. It takes Trent 9 hours longer than Sharona to do a store's inventory. If they can finish the inventory in 6 hours working together, how long does it take Sharona to do the inventory working alone.

For each of the following, list all numbers for which the rational equation is undefined.

81. $\dfrac{x}{5x+4}$

82. $\dfrac{x+3}{6x^2-4x-16}$

Solve.

83. $x^2+9x=36$

84. $x^2=x\left(3-2x^2\right)$

85. $\dfrac{5x}{9}-6=x$

86. $\dfrac{5}{m-5}-\dfrac{3}{m+5}=\dfrac{8}{m^2-25}$

87. $\dfrac{1}{x}+\dfrac{1}{y}=\dfrac{1}{z}$ Solve for y

88. $\dfrac{1}{a}-\dfrac{1}{b}=\dfrac{1}{c}$ Solve for a

89. $\dfrac{x}{2x+2}=\dfrac{-2x}{4x+4}+\dfrac{2x-3}{x+1}$

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90. $\frac{a}{x}+\frac{b}{y}=\frac{c}{z}$ Solve for y

91. $\sqrt[3]{x}+15=13$

92. $\sqrt{3x+1}-1=2x$

93. $y^{\frac{2}{3}}-y^{\frac{1}{3}}-12=0$

94. $w^2-60=0$

95. $27+x^2=0$

96. $(2+x)^2-5=4$

97. $(4x-3)(4x+3)=-49$

98. $x^2-3x=4$

99. $x^2-6x-2=0$

100. $3x^2-x=x-15$

101. $(t+6)(t+2)=8$

Perform the indicated operations:

102. $\sqrt{-10}\sqrt{-8}$

103. $(3i)(8-2i)$

104. $(8+i)+(5-6i)$

105. $(5-3i)(5+3i)$

106. $(-3i)-(3+i)$

107. $(3-4i)^2$

108. $\left(\sqrt{3}-\sqrt{-4}\right)(\sqrt{12}+\sqrt{-16})$

For each of the following, find the vertex, axis of symmetry, x and y intercepts, domain, and range:

109. $f(x)=-x^2-4x-3$

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

111. $f(x)=2x^2+8x+8$

112. A cable television technician places a 10 foot ladder against a house. The ladder reaches a point on the house that is three times its distance *d* from the base of the house. To the nearest tenth of a foot, how far up the side of the house does the ladder reach?

113. An open box is to be made from a 25 inch by 40 inch rectangular piece of cardboard by cutting squares of equal area from each corner and turning up the sides. If the specifications require the base of the box to have an area of 700 square inches, what size squares should be cut from each corner?

114. The owner of a small office supply store uses the equation $R = 100x - 2x^2$ to determine the number of cases of paper x he needs to sell each week for revenue of R dollars. How many cases does he need to sell each week for revenue of $1250?

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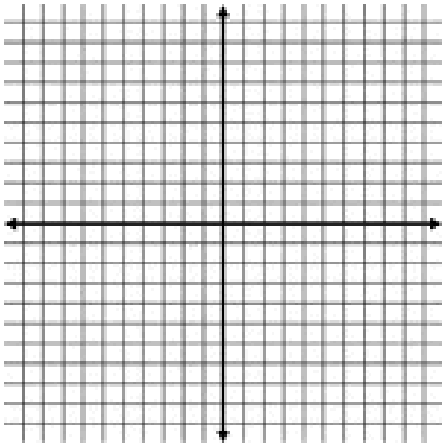
115. It takes an older printing press 5 hours longer to complete a print job than a newer printing press. If the printing presses work together, they can complete the job in 2 hours. To the nearest tenth of an hour, how long does it take each press to complete the job working alone?

116. A city parks department uses 300 feet of fencing to enclose a rectangular playground in one of its parks.

a.) Express the width *w* of the playground in terms of the length l.

b.) Express in function notation the relationship between the area *A(l)* and the length of the playground.

c.) Graph the function.



d.) What dimensions will maximize the area of the playground? What is the maximum area?

117. A baseball is hit straight upward with an initial velocity of 80 ft/sec from a height of 4 ft. The height *h* (in feet) of the baseball above the ground *t* seconds after it is hit is modeled by the function $h(t) = -16t^2 + 80t + 4$. For what values of *t* is the baseball 40 feet above the ground?

118. Find the distance between the points (9,-2) and (3,1).

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2. 49
3. $16r^8s^3t^5$
4. $-64y^{12}$
5. xy^4
6. 5^8
7. $\dfrac{4y^3}{x^2z^5}$
8. $\dfrac{8m^6}{n^{12}}$
9. $\dfrac{w^5z^{20}}{x^{30}y^{15}}$
10. $\dfrac{49a^6}{25b^8}$
11. $\dfrac{a^{36}}{125b^{45}}$
12. $\dfrac{a}{b^6c^3}$
13. $\dfrac{b^4}{16a^{12}}$
14. $7m^{12}\cdot\sqrt{2}$
15. $8x^2y^7\sqrt{x}$
16. $3x^4y^2\cdot\sqrt[10]{x^7y}$
17. $\dfrac{6a^2+1}{a(6a-1)}$
18. $\dfrac{x-16}{x-4}$
19. $\dfrac{1}{x+3}$
20. $\dfrac{3(y+2)}{3y-4}$
21. $\dfrac{z-5}{z}$
22. $\dfrac{1-x}{4+3x}$
23. $\dfrac{1}{2x-5}$
24. $\dfrac{4}{2y+1}$
25. $\dfrac{-25(b-6)}{b(b-5)(b+5)}$
26. $6x^{10}\cdot\sqrt{3}$
27. $x^5(y+z)^8\cdot\sqrt[5]{(y+z)^2}$
28. $3\sqrt[3]{a^2z}$
29. $2y^8\left|x^3\right|\cdot\sqrt[4]{2x^3y^3}$
30. $2a^3z^3\cdot\sqrt[5]{z^4}$
31. $-36\sqrt{5a}$
32. $-47\sqrt{3}$
33. $14\cdot\sqrt[3]{2}-10\sqrt{2}$
34. $x\cdot\sqrt[7]{xy}$
35. $11x\cdot\sqrt[11]{xy}$
36. $(3x+4)(5x+3)$
37. $(4x+3)(5x-2)$
38. $(10x+3)(x-4)$

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39. $-5(5a+1)(3a-4)$

40. $-3(2a-3)(4a-5)$

41. $4(4a-5)(4a+3)$

42. $-8\left(x^2+3xy+4y^2\right)$

43. $3(4x-3)^2$

44. Prime

45. $(a-13)(a-2)$

46. $\left(x^2+r^2\right)(x-r)(x+r)$

47. $9(x-5y)(x+y)$

48. $(3x+2y)(x-4y)$

49. $4(3x-4y)(x+y)$

50. $2(x-9)\left(x^2-3\right)$

51. $(2x-1)(2x+1)(x-5)$

52. $2\left(x^3-3x^2-2x-6\right)$

53. $(3z-4)(8z+3)$

54. $(2x+3)(2x-3)(3x+4)$

55. Prime

56. $(a+13)(a+6)$

57. $(u+6v)(u^2-6uv+36v^2)$

58. $(y^3-3)(y^6+3y^3+9)$

59. $(2-a)\left(a^2+5a+13\right)$

60. $2x(x^2+12)$

61. $(8x-7)^2$

62. $\dfrac{\sqrt{21x}}{12xy}$

63. $\dfrac{59\sqrt{15}+668}{473}$

64. $\dfrac{27-10\sqrt{2}}{23}$

65. $\dfrac{5\sqrt{x}\left(\sqrt{x}-4\sqrt{y}\right)}{x-16y}$ or $\dfrac{5x-20\sqrt{xy}}{x-16y}$

66. 15 ft

67. 12 ft

68. 5 sec

69. 2 sec

70. 560 mi

71. 130 ft

72. 18 ft

73. $3\dfrac{3}{7}$ hr

74. $2\dfrac{2}{5}$ min

75. 10 hr

76. 5 mph

77. 20 mph

78. 12 km/hr

79. $2\dfrac{7}{19}$ mph

80. 9 hr

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81. $-\frac{4}{5}$

82. $-\frac{4}{3}, 2$

83. $-12, 3$

84. $-\frac{3}{2}, 0, 1$

85. $-\frac{27}{2}$

86. -16

87. $\frac{xz}{x-z}$

88. $\frac{bc}{b+c}$

89. 3

90. $\frac{bxz}{cx-az}$

91. -8

92. $0, -\frac{1}{4}$

93. -27 , 64

94. $w = \pm 2\sqrt{15}$

95. $x = \pm 3\sqrt{3}i$

96. $x = -5, 1$

97. $x = \pm \frac{\sqrt{10}i}{2}$

98. $x = 4, -1$

99. $x = 3 \pm \sqrt{11}$

100. $x = \frac{1}{3} \pm \frac{2}{3}\sqrt{11}i$

101. $t = -4 \pm 2\sqrt{3}$

102. $-4\sqrt{5}$

103. 6 + 24i

104. 13 – 5i

105. 34

106. -3-4i

107. $-7 - 24i$

108. 14

109. Vertex: (-2, 1);
axis: x = -2;
x-intercepts: x = -3,-1;
y-intercept: y = -3;
D:$(-\infty, \infty)$;
R:$(-\infty, 1]$

110. Vertex: (-2, -5);
axis: x = -2;
x-intercepts: x =$-2 \pm \sqrt{5}$;
y-intercept: y = -1;
D:$(-\infty, \infty)$;
R: $[-5, \infty)$

111. Vertex: (-2, 0);
axis: x = -2;
x-intercepts: x= -2, multiplicity, 2;
y-intercept: y = 8;
D:$(-\infty, \infty)$;
R: $[0, \infty)$

112. 9.5 feet

113. 2.5 in x 2.5 in

114. 25 cases per week

115. Newer press: 2.7 hours; older press: 7.7 hours

116. a.) $w = 150 - l$
b.) $A(l) = 150l - l^2$
c.) graph

d.) dimensions: 75 feet by 75 feet;
maximum area: 5625 square feet

117. t = .5 sec and 4.5 sec

118. $3\sqrt{5}$