Name: _____ **Class:** _____ **Date:** _____ **ID: A**

A2R 2.7 Extension - Quadratic Formula and the Discriminant

You Can't Spell "Fundamental Theorem of Algebra" without F-U-N!
Quadratics and Complex Numbers

1. The Internet Bargains Company models their profit during different 20-day periods throughout the year. The function $p(x)$ represents the daily profit (in thousands of dollars) on the xth day of each period. When $p(x) > 0$, the company has a daily profit. When $p(x) < 0$, the company has a daily loss.

a. The model for one 20-day period is $p(x) = 0.04(x - 10)^2 + 2$. Determine which of the days in the 20-day period the company made a profit without using a calculator. Explain your reasoning.

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b. The model for one 20-day period is $p(x) = -0.1(x - 3)(x - 15)$. Determine which of the days in the 20-day period the company made a profit without using a calculator. Explain your reasoning.

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c. The model for one 20-day period is $p(x) = -0.06(x - 9)^2$. Determine which of the days in the 20-day period the company made a profit without using a calculator. Explain your reasoning.

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2. Determine the number of roots for each given equation and whether the roots are real or imaginary.

a. $0 = 9x^2 - 6x + 1$

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b. $0 = 2x^2 + 9x + 10$

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c. $0 = x^2 - 3x + 5$

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3. Write a quadratic equation in standard form with the given roots.

a. Write a quadratic equation with a double root of -5.

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b. Write a quadratic equation with a root of $-3+2i$.

A2R 2.7 Extension - Quadratic Formula and the Discriminant
Answer Section

1. ANS:

a. Answers will vary.

The function has no real zeros because the graph has a vertex above the *x*-axis and is concave up. The function has only positive values during the 20-day period. Therefore, the company had a profit during each of the 20 days in the period.

b. Answers will vary.

The function has zeros at 3 and 15 which means the company broke even on days 3 and 15. The function is concave down, so it has positive values between day 3 and day 15. Therefore, the company had a profit from day 4 through day 14 during this period.

c. Answers will vary.

The function has a vertex on the *x*-axis and it is concave down, so it has no positive values during the 20-day period. Therefore, the company did not have a profit on any of the 20 days in the period.

PTS: 1 REF: 2.7 NAT: N.CN.7 | N.CN.8(+) | N.CN.9(+)
TOP: Assignment
KEY: imaginary roots | discriminant | imaginary zeros | Fundamental Theorem of Algebra | double root

2. ANS:

a. $b^2 - 4ac = (-6)^2 - 4(9)(1)$

$= 36 - 36$

$= 0$

The equation has 2 real double roots.

b. $b^2 - 4ac = 9^2 - 4(2)(10)$

$= 81 - 80$

$= 1$

The equation has 2 real roots.

c. $b^2 - 4ac = (-3)^2 - 4(1)(5)$

$= 9 - 20$

$= -11$

The equation has 2 imaginary roots.

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3. ANS:

a. Answers will vary.

$0 = (x + 5)(x + 5)$

$0 = x^2 + 5x + 5x + 25$

$0 = x^2 + 10x + 25$

b. Answers will vary.

The equation must also have an imaginary root of $-3 - 2i$.

$0 = (x - (-3 + 2i))(x - (-3 - 2i))$

$0 = (x + 3 - 2i)(x + 3 + 2i)$

$0 = x^2 + 3x + 2xi + 3x + 9 + 6i - 2xi - 6i - 4i^2$

$0 = x^2 + 6x + 9 - 4(-1)$

$0 = x^2 + 6x + 9 + 4$

$0 = x^2 + 6x + 13$

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