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# *Pre-Calculus 11*
# Final Exam Multiple Choice and Numerical Response

*Record your answers on the sheet provided.*

6. What is the value of $\theta$, $0° \leq \theta < 360°$, if $\sin\theta = 0.3256$?

   **A** 0.006 **B** 19°and 199° **C** 19° and 161° **D** 199° and 341°

7. What is the value of $\theta$, $0° \leq \theta < 360°$, if $\tan\theta = -\frac{1}{\sqrt{3}}$?

   **A** −0.01 **B** 30° and 150° **C** 150° and 300° **D** 150° and 330°

**Numerical Response**

8. What is the reference angle to an angle of 120° in standard position?

**Numerical Response**

9. The point P(6, −5) lies on the terminal arm of an angle in standard position. What is the value of the angle, to the nearest degree?

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**14.** Two ferries leave Tsawwassen, BC, at 1:00 p.m. The first vessel travels on a bearing of N68°W toward Departure Bay at a speed of 26 km/h. The second vessel travels at a speed of 35 km/h on a bearing of S33°W toward Swartz Bay. How far apart are the ferries at 1:30 p.m.?

**A** 19.5 km **B** 23.3 km **C** 23.7 km **D** 47.4 km

*Use this information to answer #15–17.*

The height in feet, $h$, of a ball thrown in the air after $t$ seconds is given the equation $h(t) = -16t^2 + 48t + 3$.

**15.** What is the maximum height that the ball reaches?

**A** 36 ft **B** 39 ft **C** 43 ft **D** 51 ft

**16.** How long does it take for the ball to reach the maximum height?

**A** 1.1 s **B** 1.5 s **C** 1.8 s **D** 2.2 s

**17.** To the nearest hundredth of a second, how long is the ball is in the air?

**A** 2.83 s **B** 3.00 s **C** 3.06 s **D** 3.17 s

**Numerical Response**

**18.** What is the least root of the equation $6x^2 + 5x + 1 = 0$? Express your answer in decimal form.

**Numerical Response**

**19.** What is the greatest common factor of the expression $3x^2 + 6x - 21$?

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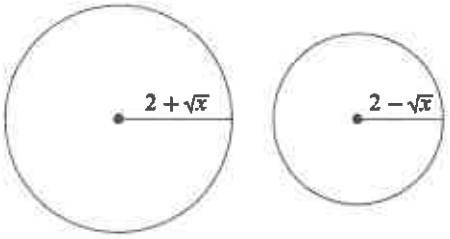
**20.** In $\triangle ABC$, where $\angle A = 24°$, $a = 60$, and $b = 90$, which of the following solves the triangle where $c$ is the largest side?

**A** $\angle A = 24°, \angle B = 52°, \angle C = 104°, a = 60, b = 90, c = 119$
**B** $\angle A = 24°, \angle B = 65°, \angle C = 91°, a = 60, b = 90, c = 110$
**C** $\angle A = 24°, \angle B = 142°, \angle C = 14°, a = 60, b = 90, c = 36$
**D** $\angle A = 24°, \angle B = 38°, \angle C = 118°, a = 60, b = 90, c = 130$

**21.** The ratio of the radii of two circles is 3 : 2. Expressed in terms of $\pi$, what are the areas of the circles if the radius of the larger circle is $(2 + \sqrt{x})$ cm and the radius of the smaller circle is $(2 - \sqrt{x})$ cm, $x \geq 0$?




**A** larger circle: $\frac{x+3}{x+2} + \frac{x+11}{x^2-5x-14}$; smaller circle: $\frac{1150}{625}\pi$
**B** larger circle: $\frac{54}{25}\pi$; smaller circle: $\frac{46}{25}\pi$
**C** larger circle: $\frac{144}{625}\pi$; smaller circle: $\frac{64}{625}\pi$
**D** larger circle: $\frac{144}{25}\pi$; smaller circle: $\frac{64}{25}\pi$

**22.** Natalie is building a rectangular greenhouse. Since it is adjacent to her house, she only needs to build three sides of the greenhouse. Natalie's budget will allow her to build walls with a total length of 20 ft. What dimensions will ensure a greenhouse with the maximum possible area?

**A** 5 ft × 5 ft **B** 6.6 ft × 6.6 ft **C** 10 ft × 5 ft **D** 10 ft × 10 ft

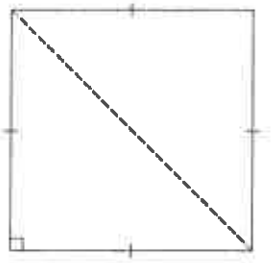
*Use this information to answer #23–24.*

A square yard has an area of 98 m².

**23.** What are the dimensions of the yard in simplest radical form?

**A** $7\sqrt{2}$ m by $7\sqrt{2}$ m **B** $\sqrt{98}$ m by $\sqrt{98}$ m
**C** $7\sqrt{14}$ m by $7\sqrt{14}$ m **D** $98\sqrt{1}$ m by $98\sqrt{1}$ m

**24.** What is the length of a diagonal of the yard in simplest radical form?



**A** $\sqrt{14}$ m **B** 14 m **C** $14\sqrt{2}$ m **D** 20 m

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**25.** What is the solution to $\sqrt{2x+3} - \sqrt{x+2} = 2$?

**A** There are no solutions. **B** $x = 1$

**C** $x = 1$ and $x = 23$ **D** $x = 23$

**26.** What is the solution to $|5x + 1| = -3x + 15$?

**A** There are no solutions. **B** $x = \frac{14}{8}$

**C** $x = -8$ **D** $x = \frac{14}{8}$ and $x = -8$

**27.** You and a friend go on a cycling trip. On the first day, you plan to travel a total distance of 56 km, 14 km of which is uphill. On level ground, you cycle at a speed of $b$ km/h. You slow down by 4 km/h when going uphill. If your total travel time is 5 h, what is your speed on level ground?

**A** $b = 2.7$ **B** $b = 12.5$ **C** $b = 2.7$ and $b = 12.5$ **D** There are no solutions.

*Use this information to answer #28–29.*

For the following rational expression, $\frac{x+3}{x+2} + \frac{x+11}{x^2-5x-14}$

**28.** Which of the following is the sum?

**A** $\frac{x^2-3x+10}{(x-7)(x+2)}$ **B** $\frac{x-5}{x-7}$ **C** $\frac{x+3}{x+2} + \frac{x+11}{(x-2)(x-7)}$ **D** $\frac{x+5}{x-7}$

**29.** What are the restrictions on the variable?

**A** $x \neq -2, x \neq 5$ **B** $x \neq 7$ **C** $x \neq -2, x \neq 7$ **D** $x \neq 5, x \neq 7$

**Numerical Response**

**30.** Solve for $x$: $\sqrt{(x^2-16)} = \sqrt{(x-4)}$.

*Use this information to answer #31–32.*

For the following rational expression, $\frac{x+5}{x^2-9} + \frac{x-5}{2x-6} = \frac{x}{x+3}$

**31.** What is the solution to the equation?

**A** $x = 1$ **B** $x = 5$ **C** $x = 5$ and $x = 1$ **D** There is no solution.

**32.** What are the restrictions on the variable?

**A** $x \neq 3, x \neq -3$ **B** $x \neq -3$ **C** $x \neq 5$ **D** $x \neq 5, x \neq -5$

**Numerical Response**

**33.** For what value of $x$ is $\frac{x^2-9}{x-2}$ undefined?

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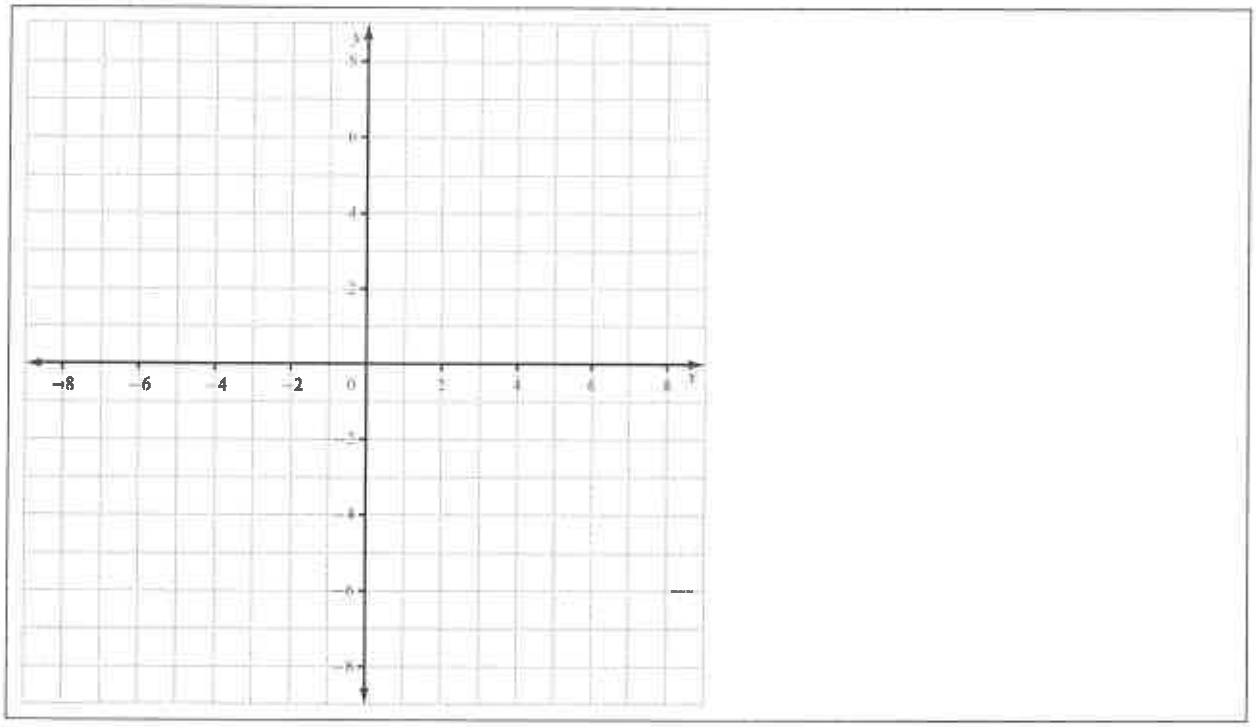
*Use this grid to sketch a graph to help you answer #40–41.*




**40.** Given $y = -2(x + 4)^2 + 5$, what is the equation of the axis of symmetry of the graph of the function?

**A** $x = -4$ **B** $x = -2$ **C** $x = 4$ **D** $x = 5$

**41.** What is the domain and range of the function $y = -2(x + 4)^2 + 5$?

**A** domain: $\{x \mid x \in \mathrm{R}\}$; range: $\{y \mid y \in \mathrm{R}\}$
**B** domain: $\{x \mid x \in \mathrm{R}\}$; range: $\{y \mid y \geq 5, y \in \mathrm{R}\}$
**C** domain: $\{x \mid x \geq -4; x \in \mathrm{R}\}$, range: $\{y \mid y \leq 5, y \in \mathrm{R}\}$
**D** domain: $\{x \mid x \in \mathrm{R}\}$; range: $\{y \mid y \leq 5, y \in \mathrm{R}\}$

**42.** Given $y = -\frac{1}{3}x^2 - 2x - 2$, what are the $x$-intercepts and $y$-intercepts of the graph of the function?

**A** $x$-intercept: $(-1.3, 0)$; $y$-intercept: $(0, -2)$
**B** $x$-intercepts: $(-4.7, 0)$ and $(-1.3, 0)$; $y$-intercept: $(0, -2)$
**C** $x$-intercept: $(0, -2)$; $y$-intercept: $(-1.3, 0)$
**D** $x$-intercept: $(0, -2)$; $y$-intercepts: $(-4.7, 0)$ and $(-1.3, 0)$

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*Use this information to answer #43–44.*

The popularity, $p$, of an Internet game is modelled by $p = -0.1d^2 + 2d + 35$, where $d$ is the number of days the game has been available.

**43.** Which statement best explains why is it reasonable for this situation to be modelled by a quadratic function?

**A** It is reasonable for this situation to be modelled by a quadratic function because the popularity of a game usually starts low and becomes increasingly popular over time.

**B** It is reasonable for this situation to be modelled by a quadratic function because the popularity of a game usually starts high and then decreases over time.

**C** It is reasonable for this situation to be modelled by a quadratic function because the popularity of a game remains constant over time.

**D** It is reasonable for this situation to be modelled by a quadratic function because the popularity of a game usually increases, peaks, and then decreases over time.

**44.** On which day will the game be most popular?

**A** 10th day **B** 20th day **C** 35th day **D** 45th day

**45.** The equation $x^2 - 2x + 36 = 0$ has how many roots?

**A** no real roots **B** 1 real root **C** 2 real roots **D** 4 real roots

**46.** Which statement best describes why an equation with a discriminant of zero has one distinct real root?

**A** Consider the quadratic equation. When the discriminant is zero, the distinct real root is zero.

**B** Consider the quadratic equation. When the discriminant is zero, the equation is reduced to $x = \frac{\pm\sqrt{b^2 - 4ac}}{2a}$.

**C** Consider the quadratic equation. When the discriminant is zero, the equation is reduced to $x = \frac{-b \pm 0}{2a}$, or $x = \frac{-b}{2a}$.

**D** Consider the quadratic equation. When the discriminant is zero, the equation is reduced to $x = \frac{b \pm 0}{2a}$, or $x = \frac{b}{2a}$.

**47.** Which quadratic equation has roots of $-\frac{4}{5}$ and 3?

**A** $x^2 - \frac{4}{5}x + 3 = 0$ **B** $x^2 + 11x - 12 = 0$

**C** $5x^2 - 11x - 12 = 0$ **D** $5x^2 + 11x - 12 = 0$

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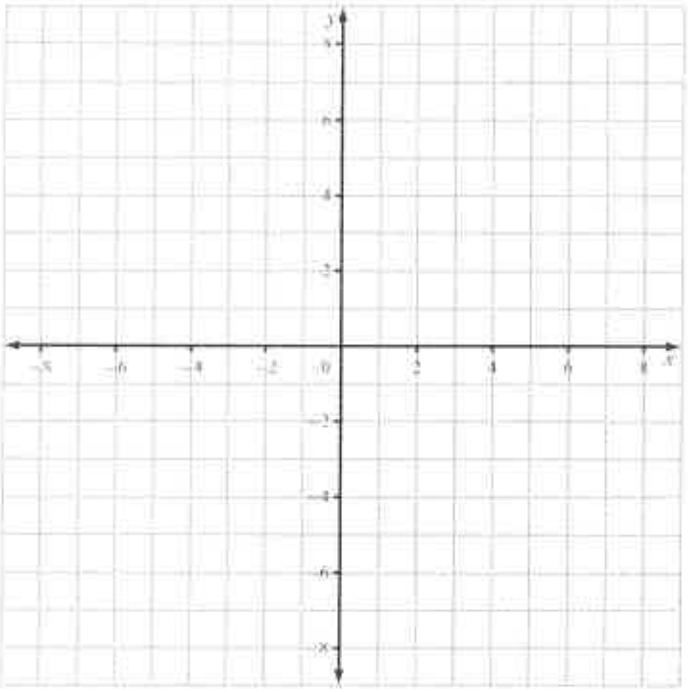
# *Pre-Calculus 11*

## Final Exam Written Response

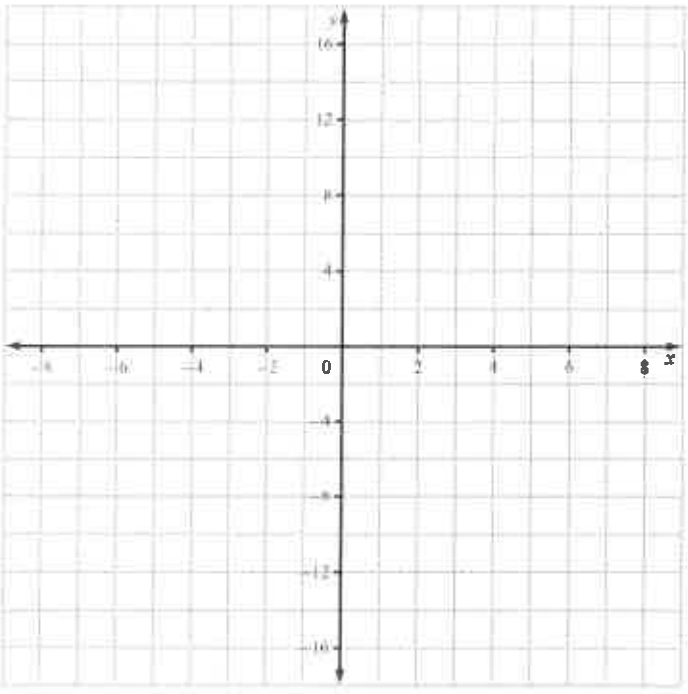
*Write your response in the space provided. Present your response in a well-organized way, using complete sentences and correct units.*

**1.** Solve each system of equations by graphing. In each case, show the points of intersection and explain in words what they represent.

**a)** $3y + x^2 + 6x - 3 = 0$
$y + x - 1 = 0$



**b)** $y + 2x^2 - 12x = -8$
$y - 2x^2 + 16x = 32$



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**2.** Solve each system of equations algebraically. Verify your solutions and explain in words what the points of intersection represent.

**a)** $-2x^2 - 3x - y = -17$
$y = -5x + 13$

**b)** $2x^2 - y - 2x = -3$
$-y + x^2 + 5x = 7$

**3.** Two numbers have a sum of 30.

**a)** Use inequalities to determine possible values for the numbers if their product is at least 150.

**b)** Use this problem to describe the differences between an inequality and an equation.

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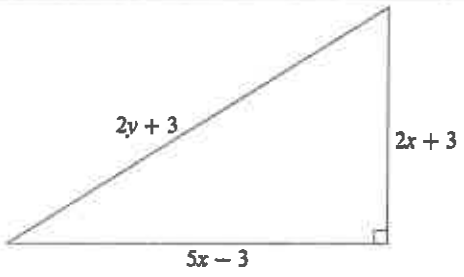
*Use this information to answer #4.*

The perimeter of the triangle is 36 cm. The area of the triangle is $9y$ cm$^2$.




**4. a)** Write a simplified expression for the triangle's perimeter in terms of $x$ and $y$.

**b)** Write a simplified expression for the triangle's area in terms of $x$ and $y$.

**c)** Write a system of equations and explain how it relates to this problem.

**d)** Solve the system for $x$ and $y$. What are the dimensions of the triangle?

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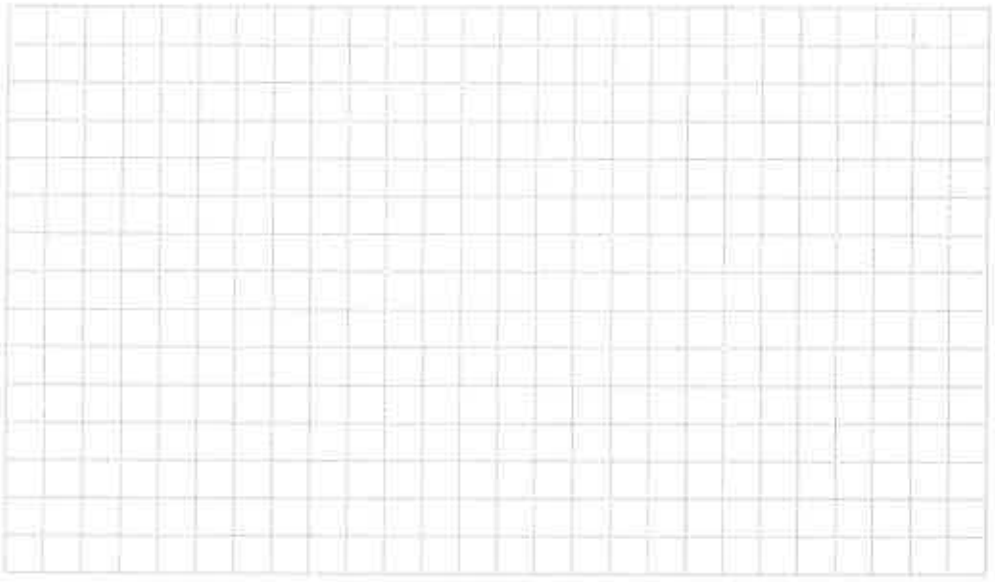
**5.** In order to get the most revenue from an outdoor concert, the promoters need to have as many concert goers as possible at a price per person that is reasonable. If the price of a ticket is \$10, 400 people will attend. Research has shown that for every \$1 increase in the price of a ticket, 20 fewer people will attend. The relationship between the number of price increases and the revenue is given by $y \leq (400 - 20x)(10 + x)$, where $x$ is the number of \$1 price increases and $y$ is total revenue, in dollars.

**a)** Graph the quadratic inequality.



**b)** What increase in ticket price will generate revenue of at least \$3000?

**c)** How many concert goers are needed to generate revenue of at least \$3000?

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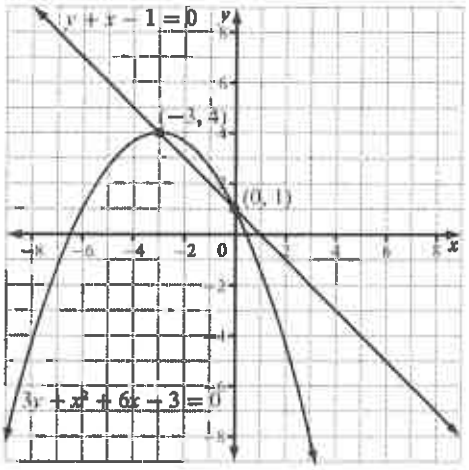
# Final Exam Answers

## Multiple Choice and Numerical Response Answers

1. B
2. C
3. A
4. C
5. B
6. C
7. D
8. 60°
9. 320°
10. C
11. B
12. C
13. A
14. A
15. B
16. B
17. C
18. −0.5
19. 3
20. D
21. D
22. C
23. A
24. B
25. D
26. D
27. B
28. B
29. C
30. 4
31. C
32. A
33. 2
34. B
35. C
36. 17
37. 10
38. A
39. D
40. A
41. D
42. B
43. D
44. A
45. A
46. C
47. C
48. D
49. A
50. A
51. A

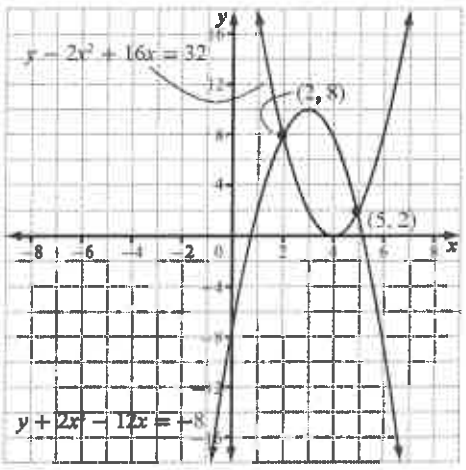
### Written Response Answers

1. a)




The points of intersection, (−3, 4) and (0, 1), represent the two solutions to the system of equations.

b)




The points of intersection, (2, 8) and (5, 2), represent the two solutions to the system of equations.

2. a) The points of intersection are (2, 3) and (–1, 18). They represent the two solutions to the system of equations.

   b) The points of intersection are (5, 43) and (2, 7). They represent the two solutions to the system of equations.

3. Example:

   a) Let $x$ and $y$ represent the two numbers: $6.34 \leq x \leq 23.66$ and $6.34 \leq y \leq 23.66$.

   b) This problem is an example of an infinite number of solutions for a system of quadratic equations. By using inequalities, you can show the entire range of possible solutions rather than two solutions.

4. a) $2y + 7x = 33$ cm

   b) $10x^2 + 9x - 9 = 18y$ cm$^2$

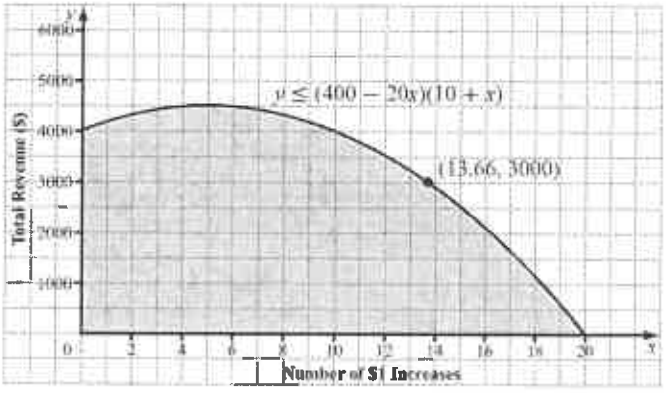
   c) $y = \dfrac{-7x + 33}{2}$

   $y = \dfrac{10x^2 + 9x - 9}{18}$

   By solving the system for $x$ and y, you are able to determine the dimensions of the triangle.

   d) The solution to the system is (3, 6). The length of the hypotenuse is 15 cm and the lengths of the other two sides are 9 cm and 12 cm, respectively.

5. a)




   b) Example: From the graph, it can be seen that revenue is at least $3000 where the number of $1 increases in the ticket price is less than or equal to 13 ($0 \leq x \leq 13.66$).

   c) 127 concert goers

6. a)–c) Example: The graph of a function and the graph of its inverse are similar because the points are the same, but different because the variables are switched, or mirrored, over the line $y = x$.

7. Example: Choose a number of points from the graph of $f(x)$ and reflect them about the line $y = x$. Another method is to create a table of values and switch the $x$-values and $y$-values.

8. Example: Choose a number of points from the graph of $\dfrac{1}{f(x)}$ and reflect them about the line $y = x$. Another method is to create a table of values and switch the $x$-values and $y$-values.

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# *Pre-Calculus 11*

## Final Exam Muitiple Choice and Numerical Response Answer Sheet

*For multiple choice questions, circle the letter that corresponds to the best answer.*

Example:

What is the product of (8.5)(0.7)?

**A** 59.5 **B** 12.14

**C** 5.95 **D** 1.214

Answer Sheet

**A B (C) D**

*For numerical response questions, write your answer in the boxes provided.*
*If an answer is a value between 0 and 1 (e.g., 0.7), record the 0 before the decimal place.*
*Enter the first digit of your answer in the left-hand box. Leave blank any boxes on the right-hand side that are not needed.*

Example:
In $2n + 0.7$, the constant is

Answer Sheet

*Record your answers on the sheet provided.*

Record 0.7 on the answer sheet. → | 0 | . | 7 | |

**1.** A B C D
**2.** A B C D
**3.** A B C D
**4.** A B C D
**5.** A B C D
**6.** A B C D
**7.** A B C D
**8.** | | | | |
**9.** | | | | |
**10.** A B C D
**11.** A B C D
**12.** A B C D
**13.** A B C D
**14.** A B C D
**15.** A B C D
**16.** A B C D
**17.** A B C D
**18.** | | | | |
**19.** | | | | |
**20.** A B C D
**21.** A B C D
**22.** A B C D
**23.** A B C D
**24.** A B C D
**25.** A B C D
**26.** A B C D
**27.** A B C D
**28.** A B C D
**29.** A B C D
**30.** | | | | |
**31.** A B C D
**32.** A B C D
**33.** | | | | |
**34.** A B C D
**35.** A B C D
**36.** | | | | |
**37.** | | | | |
**38.** A B C D
**39.** A B C D
**40.** A B C D
**41.** A B C D
**42.** A B C D

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**43.** A B C D
**44.** A B C D
**45.** A B C D
**46.** A B C D
**47.** A B C D
**48.** A B C D
**49.** A B C D
**50.** A B C D
**51.** A B C D