A2.A.4: Solve quadratic inequalities in one and two variables, algebraically and graphically

1. 010904b, P.I. A2.A.4

    What is the solution of the inequality $x^2 - x - 6 < 0$?

    [A] $1 < x < 6$ [B] $-3 < x < 2$

    [C] $-2 < x < 3$ [D] $-3 < x < -2$

2. 080713b, P.I. A2.A.4

    What is the solution set of the inequality $x^2 + 4x - 5 < 0$?

    [A] $\{x | x < -5 \text{ or } x > 1\}$

    [B] $\{x | -5 < x < 1\}$ [C] $\{x | -1 < x < 5\}$

   [D] $\{x | x < -1 \text{ or } x > 5\}$

3. 010509b, P.I. A2.A.4

    Which graph represents the solution set of the inequality $x^2 - 4x - 5 < 0$?

    [A]

    [B]

    [C]

    [D]
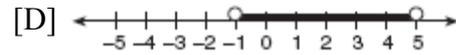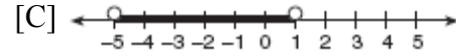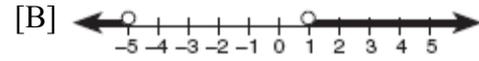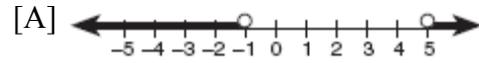
4. 010318b, P.I. A2.A.4

    Which graph represents the solution set of $x^2 - x - 12 < 0$?

    [A]

    [B]

    [C]

    [D]
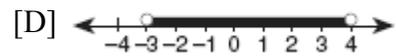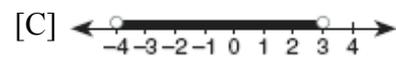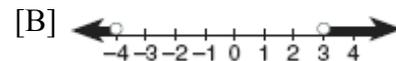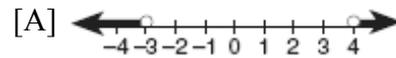
5.   060632b, P.I. A2.A.4

A small rocket is launched from a height of 72 feet. The height of the rocket in feet, *h*, is represented by the equation $h(t) = -16t^2 + 64t + 72$, where t = time, in seconds. Graph this equation on the accompanying grid. Use your graph to determine the number of seconds that the rocket will remain at or above 100 feet from the ground. [Only a graphic solution can receive full credit.]
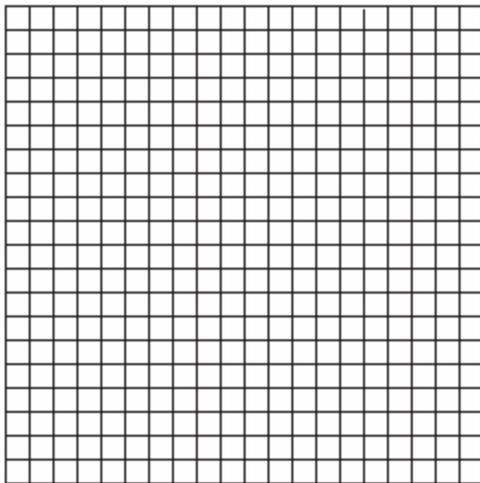
6.   060532b, P.I. A2.A.4

The height of a projectile is modeled by the equation $y = -2x^2 + 38x + 10$, where x is time, in seconds, and y is height, in feet. During what interval of time, to the *nearest tenth of a second*, is the projectile *at least* 125 feet above ground? [The use of the grid is optional.]
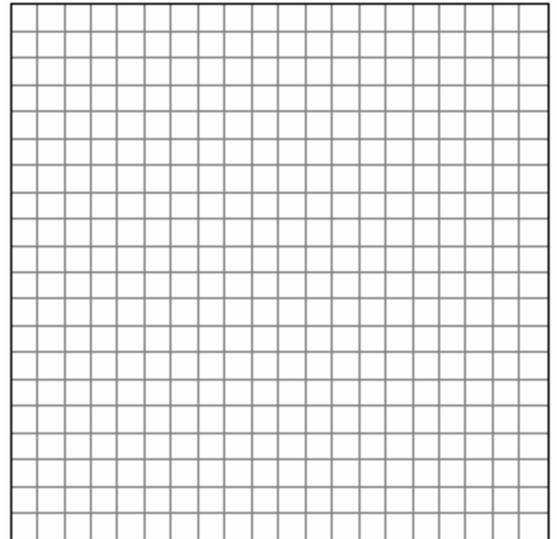
7. 010231b, P.I. A2.A.4

When a baseball is hit by a batter, the height of the ball, h(t), at time t, $t \geq 0$, is determined by the equation $h(t) = -16t^2 + 64t + 4$. For which interval of time is the height of the ball greater than or equal to 52 feet?

8. 080424b, P.I. A2.A.4

The profit a coat manufacturer makes each day is modeled by the equation $P(x) = -x^2 + 120x - 2000$, where P is the profit and x is the price for each coat sold. For what values of x does the company make a profit? [The use of the grid is optional.]
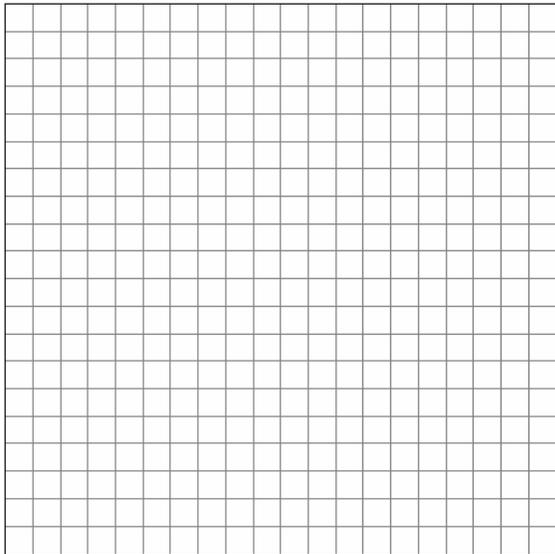
9. 080531b, P.I. A2.A.4

The profit, P, for manufacturing a wireless device is given by the equation $P = -10x^2 + 750x - 9{,}000$, where x is the selling price, in dollars, for each wireless device. What range of selling prices allows the manufacturer to make a profit on this wireless device? [The use of the grid is optional.]
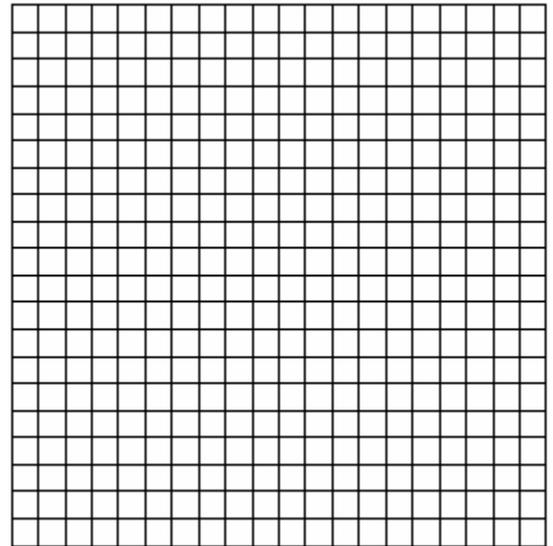
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[1] C

[2] B

[3] D

[4] D

[4] A correct graph is drawn, and 3.
[3] 3, and appropriate work is shown, but one graphing error is made.
or [3] A correct graph is drawn and the points 0.5 and 3.5 are identified, but the difference is not calculated.
[2] Appropriate work is shown, but two or more graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] 3, but a method other than a graphic solution is used.
[1] Appropriate work is shown, but one conceptual error and one graphing error are made.
or [1] A correct graph is sketched with $t = 0$ to $t = 4$, but no further correct work is shown.
or [1] 3, but no work is shown and no graph is drawn.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[5] incorrect procedure.

[4] $3.8 \le x \le 15.2$, and appropriate work is shown, such as using the quadratic formula or sketching the graph of the parabola and the line.
[3] Appropriate work is shown, but one computational, rounding, or graphing error is made.
or [3] $3.8 < x < 15.2$, and appropriate work is shown.
[2] Appropriate work is shown, but two or more computational, rounding, or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The graph of the parabola and the line are sketched correctly, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational, rounding, or graphing error are made.
or [1] Correct substitution is made into the quadratic formula, but no further correct work is shown.
or [1] The graph of the parabola is sketched correctly, but no further correct work is shown.
or [1] $3.8 \le x \le 15.2$, but no work is shown.
[0] $3.8 < x < 15.2$, but no work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[6] obviously incorrect procedure.

[4] $1 \le t \le 3$, and appropriate work is shown, such as $-16t^2 + 64t + 4 \ge 52$.
[3] Appropriate work is shown, but one computational error is made.
or [3] An incorrect inequality is written, but the resulting quadratic inequality is solved appropriately.
[2] Appropriate work is shown, but more than one computational error is made.
or [2] The quadratic equation $-16t^2 + 64t + 4 = 52$ is solved appropriately, and both solutions are found.
[1] An incorrect quadratic equation of equal difficulty is solved appropriately, but one computational error is made.
or [1] $1 \le t \le 3$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[7] incorrect procedure.

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[2] $20 < x < 100$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or graphing error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown to solve for 20 and 100, but the solution is not expressed as a correct inequality or interval.
or [1] $20 < x < 100$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[8] incorrect procedure.

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[4] $15 < x < 60$, and appropriate work is shown, such as solving the algebraic inequality $-10x^2 + 750x - 9000 > 0$ or a graphic solution.
[3] Appropriate work is shown, but one computational or graphing error is made.
[3] $15 \le x \le 60$, and appropriate work is shown.
[2] Appropriate work is shown, but two or more computational or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made, such as solving the equation $-10x^2 + 750x - 9000 > 0$ for 15 and 60.
or [2] An incorrect inequality of equal difficulty is solved appropriately.
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
or [1] $15 < x < 60$, but no work is shown.
[0] $15 \le x \le 60$, and no work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[9] obviously incorrect procedure.