Review Problems

Please note that Quiz 5 will also cover topics cevered on Quizzes 1-4 and Exam 1. Please review those topics as well, even if they do not appear on this document.

1. Factor by completing the square $18x^2 - 24x - 2$

2. Consider the parabola $y = x^2 + 7x - 6$.
   a) Find both coordinates of the vertex. b) Find all $x-$intercepts. Present exact values.

3. Solve each of the following inequalities.
   a) $12x - 2x^2 \leq 20$ c) $10x + 5x^2 \leq -25$ e) $x^2 + x > 1$
   b) $3x^2 - 12x < 3$ d) $10x + 5x^2 \geq 25$

4. For each of the following pairs of graphs, find the coordinates of all points where they intersect.
   a) $y = x^2 + 7x - 6$ and $y = 3x - 1$ d) $x^2 + (y+4)^2 = 20$ and $x - 3y = 2$
   b) $y = -\frac{1}{2}x^2 + 5x - 3$ and $y = 3x - 1$ e) $(x-2)^2 + (y+5)^2 = 10$ and $3y - x = -7$
   c) $y = 3x^2 - x + 7$ and $y = x - 4$ f) $x^2 + (y+1)^2 = 16$ and $y + 2x = 15$

5. Find an eqaution for the line connecting the points of intersections of the circles $(x-4)^2 + (y-3)^2 = 25$ and $(x+2)^2 + (y+5)^2 = 125$

6. Find an equation of the tangent line drawn to $2y - 6x + x^2 + y^2 = 40$ to the point $(10, -2)$.

7. Find the height of the pyramid $ABCDE$ if its base is rectangle $ABCD$ with sides 6 m and 10 m and side $AE = BE = CE = DE = 14$ m.

8. The sum of two numbers is 20.
   a) Find the maximal value of their product.
   b) Find the minimal value of the sum of their squares.

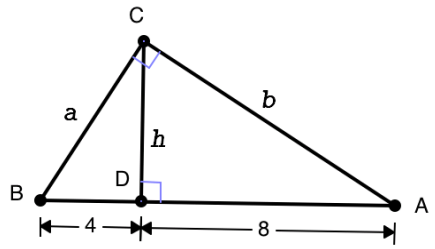
9. When we price a ticket at \$50, then we can sell 2000 tickets For every dollar increase in the price, we can sell 10 less tickets. Find the maximal revenue possible, and find the price that guarantees the maximal income.

10. Find the exact value of the area of the triangle with sides 16 ft, 17 ft, and 17 ft.

11. Side AB of a rectangle $ABCD$ is located on the $x-$ axis, within the interval $[-4, 4]$. Another horizontal side is defined by points C and D, lying on the straight lines $y = 3x+12$ and $y = -3x+12$, respectively. Find the maximal possible area of the rectangle.

12. Find an equation for the tangent line drawn to the graph of $2y + x^2 + y^2 = 3(2x + 5)$ at the point $(7, -4)$.

13. Consider the right triangle ABC shown on the picture below. Find the exact values of a, b, and h.



14. Two real numbers a and b are such that $a + 3b = 10$. Find
    a) the exact values of a and b if $ab = -32$.
    b) the maximal possible value of ab.
    c) the smallest possible value of $a^2 + b^2$.

15. Consider the arithmetic sequence defined by its first element $a = -50$ and its common difference $d = 7$.
    a) Compute each of the following. a_{10} s_{10} a_{35} s_{35} b) $n =?$ if $a_n = 272$.

16. Consider the arithmetic sequence $100, 97, 94, 91, ...$
    a) Compute each of the following. a_{20} s_{20} a_{60} s_{60} b) $n =?$ if $a_n = -158$.

Answers

1.) $18\left(x - \frac{2+\sqrt{5}}{3}\right)\left(x - \frac{2-\sqrt{5}}{3}\right)$ 2.) a) $\left(-\frac{7}{2}, -\frac{73}{4}\right)$ b) $\left(\frac{-7-\sqrt{73}}{2}, 0\right)$ and $\left(\frac{-7+\sqrt{73}}{2}, 0\right)$

3.) a) all real numbers b) $\left(2-\sqrt{5}, 2+\sqrt{5}\right)$ c) no solution d) $\left(-\infty, -1-\sqrt{6}\right] \cup \left[-1+\sqrt{6}, \infty\right)$
e) $\left(-\infty, -\frac{-1-\sqrt{5}}{2}\right) \cup \left(\frac{-1+\sqrt{5}}{2}, \infty\right)$

4.) a) $(1, 2)$ and $(-5, -16)$ b) $(2, 5)$ c) no intersection point d) $(-4, -2)$ and $(2, 0)$
e) $(1, -2)$ f) no intersection point

5.) $y = -\frac{3}{4}x + 6$ or $3x + 4y = 24$ 6.) $y + 2 = 7(x - 10)$ or $y = 7x - 72$ 7.) $\sqrt{162}\,\text{m} = 9\sqrt{2}\,\text{m}$

8.) a) 100 b) 200 9.) \$156 250 with a price of \$125 10.) $120\,\text{ft}^2$ 11.) 24

12.) $\frac{4}{3}(x-7) = y + 4$ or $y = \frac{4}{3}x - \frac{40}{3}$ 13.) $a = 4\sqrt{3}$ $b = 4\sqrt{6}$ $h = 4\sqrt{2}$

14.) a) $a = -6, b = \frac{16}{3}$ or $a = 16, b = -2$ b) $\frac{25}{3}$ if $a = 5, b = \frac{5}{3}$ c) 10 if $a = 1, b = 3$

15.) a) $a_{10} = 13$ $s_{10} = -185$ $a_{35} = 188$ $s_{35} = 2415$ b) 47

16.) a) $a_{20} = 43$ $s_{20} = 1430$ $a_{60} = -77$ $s_{60} = 690$ b) 87