**MATH Questions**

* **Show work/explanation where indicated**  
    
  1. (4 pts) Solve the inequality *x*2 ≥ 9*x* and write the solution set in interval notation.

(no explanation required) 1. \_\_\_\_\_\_

A. [0, 9]

B. [9, ∞)

C. (–∞, 9] ∪ [0, ∞)

D. (–∞, 0] ∪ [9, ∞)

2. (4 pts) Solve ≥ 0 and write the solution set in interval notation. 2. \_\_\_\_\_\_

(no explanation required)

A. [–6, 2) ∪ (4, ∞)

B. (–∞, –6] ∪ (2, 4)

C. [–6, ∞)

D. (2, 4)

3. (4 pts) For *f* (*x*) = *x*4 – 4*x*2 – 9, use the Intermediate Value Theorem to determine which interval must contain a zero of *f*. (no explanation required) 3. \_\_\_\_\_\_\_

A. Between 0 and 1

B. Between 1 and 2

C. Between 2 and 3

D. Between 3 and 4

4. (4 pts) Translate this sentence about stopping distance into a mathematical equation.

The area *A* of a regular hexagon is directly proportional to the square of the length *s* of its sides.

5. (8 pts) Look at the graph of the quadratic function and complete the table. **[***No explanations required.*]

|  |  |  |
| --- | --- | --- |
| **Graph** | **Fill in the blanks** | **Equation** |
| q4Parabola2.gif | State thevertex:  \_\_\_\_\_\_\_\_\_\_\_\_  State therange:  \_\_\_\_\_\_\_\_\_\_\_\_\_  State the interval on which the function is decreasing:  \_\_\_\_\_\_\_\_\_\_\_\_\_ | The graph represents which of the following equations?  **Choice:\_\_\_\_**  A. *y* = –*x*2 + 2*x* – 1  B. *y* = 2*x*2 + 4*x* – 1  C. *y* = *x*2 + 2*x* – 1  D. *y* = –2*x*2 – 4*x* + 1 |

6. (6 pts) Each graph below represents a polynomial function. Complete the following table.

(no explanation required)

|  |  |  |
| --- | --- | --- |
| Graph | C:\Users\Sue\MATH107\QuizExamBank\13Fall\4thdegree\4thdeg.gifGraph A | C:\Users\Sue\MATH107\QuizExamBank\13Fall\5thdeg\5thdeg.gif  Graph B |
| Is the degree of the polynomial **odd** or **even**? (choose one) |  |  |
| Is the leading coefficient of the polynomial **positive** or **negative**? (choose one) |  |  |
| **How many real number zeros** are there? |  |  |

7. (12 pts) Let

When factored,

(a) State the domain.

(b) Which sketch illustrates the **end behavior** of the polynomial function?

|  |  |  |  |
| --- | --- | --- | --- |
| A.  vvvv | B.  vvvv | C.  vvvv | D.  vvvv |

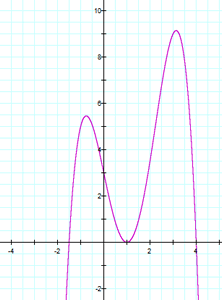
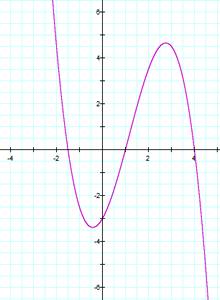
Answer: \_\_\_\_\_\_\_\_

(c) State the *y*-intercept:

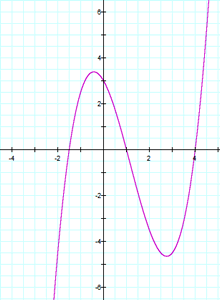
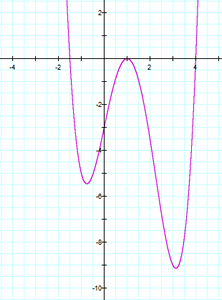
(d) State the real zeros:

(e) State which graph below is the graph of *P*(*x*).

GRAPH A. (below) GRAPH B. (below)

GRAPH C. (below) GRAPH D. (below)

8. (8 pts) Let . (no explanations required)

(a) State the *y*-intercept.

(b) State the *x*-intercept(s).

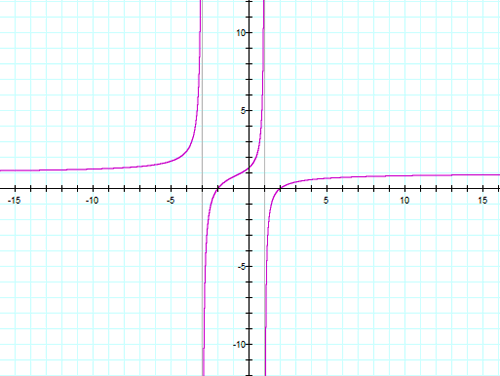
(c) State the vertical asymptote(s).

(d) State the horizontal asymptote.

9. (8 pts) Solve the equation. *Check* all proposed solutions. Show work in solving and in checking, and state your final conclusion.



10. (8 pts) Which of the following functions is represented by the graph shown below? **Explain** your answer choice. Be sure to take the asymptotes into account in your explanation.



10. \_\_\_\_\_

A.

B.

C.

D.

11. (8 pts) For *z* = 9 + 2*i* and *w* = 3 − 5*i*, find *z*/*w*. That is, determine and simplify as much as possible, writing the result in the form *a* + *bi*, where *a* and *b* are real numbers. **Show work**.

12. (8 pts) Consider the equation 13*x*2 + 2 = 10*x*. Find the complex solutions (real and non-real) of the equation, and simplify as much as possible. **Show work.**

13. (18 pts)

The cost, in dollars, for a company to produce *x* widgets is given by *C*(*x*) = 4200 + 5*x* for

*x* ≥ 0, and the price-demand function, in dollars per widget, is *p*(*x*) = 32 − 0.03*x* for 0 ≤ *x* ≤ 1066.

In Quiz 2, problem #10, we saw that the profit function for this scenario is

*P*(*x*) = − 0.03*x*2 + 27*x* − 4200.

(a) The profit function is a quadratic function and so its graph is a parabola.

Does the parabola open up or down? \_\_\_\_\_\_\_\_\_\_

(b) Find the vertex of the profit function *P*(*x*) using algebra. **Show algebraic work**.

(c) State the maximum profit and the number of widgets which yield that maximum profit:

The maximum profit is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when \_\_\_\_\_\_\_\_\_\_\_\_ widgets are produced and sold.

(d) Determine the price to charge per widget in order to maximize profit.

(e) Find and interpret the break-even points. **Show algebraic work.**