Secondary 2H
MIDTERM
NO CALCULATORS

Name Key Desk _____

MIDTERM REVIEW QUESTIONS

Score _____

The following "suggested review questions" come from the unit tests for chapters 1-6. If you still have the tests, it would be wise to go back through them to help streamline your studying by identifying areas where you should direct your studying. Additionally, refer to the "midterm review topics" list for a complete list of things you should be comfortable doing for the midterm.

Use the following choices to fill in the blanks for questions 1-4.

term constant term coefficient base exponent

1. **In the polynomial** $7t^2 - 3t + 2$, **the 7 is a(n)** Coefficient.

2. **In the polynomial** $8b^2 + 10b$, **the 2 is a(n)** EXPONENT.

3. **In the polynomial** $4x^2 + 8x - 7$, $4x^2$ **is a(n)** term.

4. **In the polynomial** $7x^2 - 9x + 2$, x **is a(n)** Base.

5. Which of the following functions are polynomials? (Circle all that apply).

a. $-3x^2 - 9^x$

b. $5t^2 - 4t + 2$

c. $4t^{-3} - 7t - 1$

d. $-6y^{2/3} + 5y - 1$

e. $7 - 14x$

f. $\sqrt[3]{6x^2 - 6x}$

For #6-9, write an equivalent expression. Your final answer should be written in standard form.

6. $(2x^2 + 4x - 7) + (4x^2 - 2x + 1) = 6x^2 + 2x - 6$

7. $-4x(x-1) = -4x^2 + 4x$

8. $(6x^2 + 9x - 12) - (8x^2 + 2x + 4) = -2x^2 + 7x - 16$

9. What is the GCF of $15x^3y^2$ and $225x^5y$? $15x^3y$

10. Which expressions are equivalent?

a. $5^{\frac{2}{3}} = \sqrt[2]{5^3}$

b. $5^{\frac{2}{3}} = \sqrt{5^3}$

c. $5^{\frac{2}{3}} = \sqrt[3]{5^2}$

d. $5^{\frac{2}{3}} = \sqrt[3]{5}$

11. Rewrite $4x^{\frac{4}{3}}$ in radical form. $4\sqrt[3]{x^4}$

12. Simplify the expression $2\sqrt{36x^3y} = 12|x|\sqrt{xy}$

13. There is a rectangle with side lengths $\sqrt{18}$ feet and $4\sqrt{3}$ feet. What is the area of the rectangle?

$= 12\sqrt{6}$ feet^2

14. Adam and Brenda were looking at the expression $5x^3 - 6x^2 + x + 4$. Adam says the expression has a degree 5 but Brenda says the expression has a degree 3. Who is correct? Write a complete sentence to explain why.

Brenda is correct because...

15. Factor the following polynomials:

a. $x^2 + 7x + 12$ $(x+4)(x+3)$

b. $x^2 - 6x + 9$ $(x-3)(x-3) = (x-3)^2$

c. $x^2 + 12x - 28$ $(x+14)(x-2)$

d. $6x^2 + 18x$ $6x(x+3)$

e. $x^2 - 144$ $(x-12)(x+12)$

f. $4x^2 - 16$ $4(x-2)(x+2)$

For #16-20, simplify each expression:

16. $(x+3)(x^2+4x-4)$ $x^3 + 7x^2 + 8x - 12$

17. $(4x-1)^2$ $16x^2 - 8x + 1$

18. $\sqrt[4]{81xy^4}$ $3|y|\sqrt[4]{x}$

19. $4\sqrt[3]{16} + 2\sqrt[3]{2}$ $10\sqrt[3]{2}$

20. $-3\sqrt{6} \cdot -\sqrt{3}$ $9\sqrt{2}$

For #21-23, determine if the function given by the table is linear, quadratic, or exponential.

21.

x	y
0	2
1	3
2	5
3	9
4	17

Exponential

22.

x	y
0	3
5	6
10	9
15	12
20	15

Linear

23.

x	y
0	-1
2	7
4	23
6	47
8	79

quadratic

24.) Find the vertex and the axis of symmetry for each quadratic:

a. $f(x) = -(x-3)^2 + 4$ vertex: $(3, 4)$ axis of symmetry: $x = 3$

b.

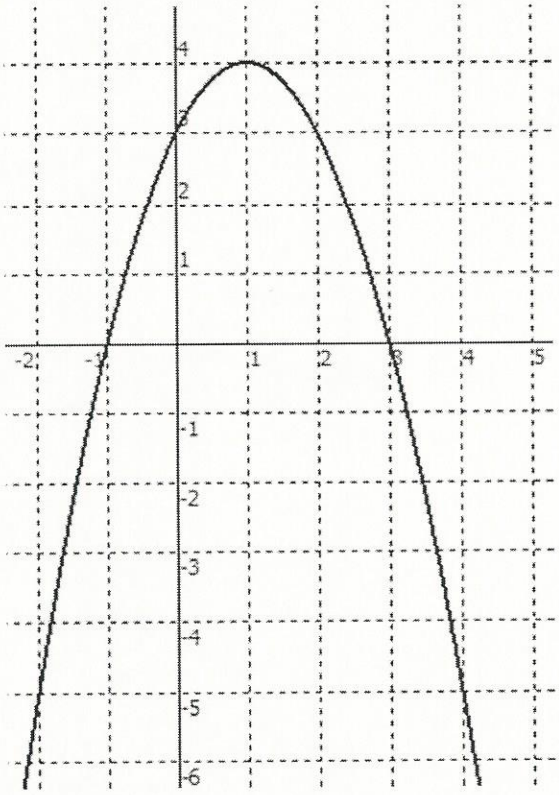
x	$f(x)$
-1	15
0	8
1	3
2	0
3	-1
4	0
5	3

vertex: $(3, -1)$ axis of symmetry: $x = 3$

c. $f(x) = x^2 - 14x + 51$

vertex: $(7, 2)$ axis of symmetry: $x = 7$

25.) Given the graph of the *f(x)*, find the following key features.



a) Find $f(0) =$ a) f(0) = 3

b) Find $f(4) =$ b) f(4) = 5

c) Find the *y*-intercept c) (0, 3)

d) Find the *x*-intercept(s) d) (-1, 0) & (3, 0)

e) Find the vertex e) (1, 4)

f) Find the domain of f(x) f) $(-\infty, \infty)$

g) Find the range of f(x) g) $(-\infty, 4]$

h) On what interval is f(x) increasing? h) $(-\infty, 1)$

i) On what interval is *f(x)* decreasing? i) $(1, \infty)$

j) On what interval is *f(x)* positive? j) (-1, 3)

k) On what interval is *f(x)* negative? k) $(-\infty, -1) \cup (3, \infty)$

l) What is the max or min value? l) Max value at 4 when x is 1

m) Is *f(x)* concave up or concave down? m) concave down

n) Right end behavior: as $x \to \infty$, $y \to$ n) $-\infty$

o) Left end behavior: as $x \to -\infty$, $y \to$ o) $-\infty$

26.) Which has a greater average rate of change over the interval [5,10]?

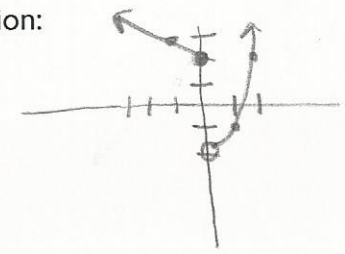
$f(x) = x^2 + 4$ or

x	*y*
0	300
5	777.5
10	1010
15	997.5
20	740
25	237.5

The table has a greater average rate of change over the interval [5, 10] because...

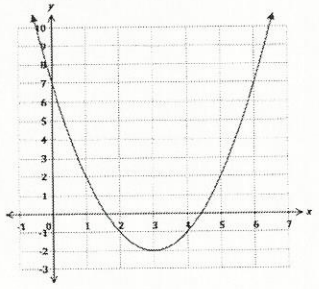
27. Graph the following piece-wise function:

$$f(x) = \begin{cases} x^2 - 2 & x > 0 \\ -x + 4 & x \leq 0 \end{cases}$$

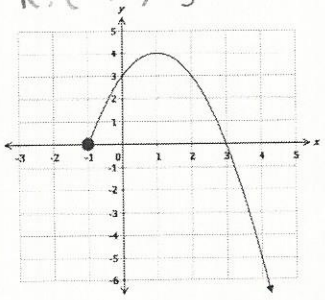


28.) Identify the **domain** and **range** of each function. Write the domain and range in **interval notation**.

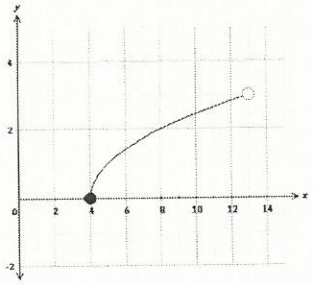
a.) D: $(-\infty, \infty)$ R: $[2, \infty)$



b.) D: $[-1, \infty)$ R: $(-\infty, 4]$



c.) D: $[4, 13)$ R: $[0, 3)$



C 29.) The path of an arrow is modeled by the function $h(t) = -16t^2 + 96t$, where the x-axis represents time in seconds and the y-axis represents the height of the arrow in feet.

a) Which window would be an appropriate window to use to show the flight of the arrow? (Circle the correct window)

WINDOW
Xmin= 0
Xmax= 3
Xscl= 0.5
Ymin= 0
Ymax= 150
Yscl= 1

WINDOW
Xmin= 0
Xmax= 7
Xscl= 1
Ymin= 0
Ymax= 150
Yscl= 20

WINDOW
Xmin= 0
Xmax= 150
Xscl= 20
Ymin= 0
Ymax=3
Yscl= .5

b) Find the **maximum height** the arrow reaches and **when** it occurs. The maximum height is 144 ft and occurs at 3 seconds.

c) When does the arrow hit the ground? The arrow hits the ground at 6 seconds.

d) What does the **x-intercept** represent? When the arrow is on the ground (0 and 6 sec).

e) What does the **y-intercept** represent? How high the arrow is when it is launched.

f) How long does the arrow stay in the air? The arrow stays in the air for 6 seconds.

30. Let $f(x) = 2x + 4$ and $g(x) = x^2 - 3x$ and $h(x) = 3x - 9$. Perform the indicated operations.

a. $(f+g)(x)$ $x^2 - x + 4$

b. $(h-g)(x)$ $-x^2 + 6x - 9$

c. $(f \cdot g)(x)$ $2x^3 - 2x - 12x$

d. $\left(\frac{h}{g}\right)(x)$ and state the domain $x \neq 0,\ x \neq 3$ $\frac{3}{x}$ $(-\infty, 0) \cup (0, 3) \cup (3, \infty)$

31. Find the domain algebraically for each of the following functions. Your answer should be in interval notation.

a. $f(x) = \sqrt{3x+6}$ $[-2, \infty)$

b. $g(x) = \dfrac{x+2}{3x-5}$ $(-\infty, \frac{5}{3}) \cup (\frac{5}{3}, \infty)$

c. $f(x) = 3x^2 - 5x + 1$ $(-\infty, \infty)$

32. For the following questions, use $f(x)=x^2$ as your parent function. Write the function that results from the given transformation:

a. Translate (shift) the parent function 2 units left. $(x+2)^2$

b. Translate (shift) the parent function 3 units up. x^2+3

c. Reflect the parent function across the x-axis. $-x^2$

d. Stretch the parent function vertically by a factor of 7. $7x^2$

e. Shift the vertex to the point (-4, 8). $(x+4)^2+8$

33. For the following questions, use $f(x)=|x|$ as your parent function. Write the function that results from the given transformation.

a. Vertical stretch by a factor of 3 and translate (shift) down 4 units. $3|x|-4$

b. Translate the graph down 7 units and to the left 6 units. $|x+6|-7$

c. Reflect across the x-axis, vertical stretch by a factor of $\frac{1}{2}$ and translate the graph up 3 units. $-\frac{1}{2}|x|+3$

34. Find the inverse of the following functions:

a. $f(x)=\frac{2x-3}{2}$ $f^{-1}(x)=\frac{2x+3}{2}$

b. $g(x)=6x+8$ $g'(x)=\frac{x-8}{6}$

c. $h(x)=\sqrt{x-1}+4$ $h'(x)=(x-4)^2+1$

35. Determine if the following functions are even, odd, or neither. Explain your reasoning.

a. $f(x)=|x+3|-1$ Neither because...

b. $f(x)=\frac{1}{3}x$ ODD because...

c. $f(x)=-3x^4+5x^2$ Even because...

d. $f(x)=4x-5$ Neither because...

36. Write the quadratic equation in standard form: $y=(x-5)^2+11$ $y=x^2-10x+36$

37. Write the quadratic equation in factored form: $y=2x^2-9x+4$ $y=(2x-1)(x-4)$

38. Write the quadratic equation in vertex form: $f(x)=3x^2-6x+10$ $y=3(x-1)^2+7$

39. Factor the following polynomials completely.

a. $2r^4+5r^3-7r^2$ $r^2(2r+7)(r-1)$

b. $6x^2+15x+9$ $3(2x+3)(x+1)$

c. $2x^2+3xy-14y^2$ $(2x+7y)(x-2y)$

d. $9x^2+24x+16$ $(3x+4)^2$

40. Consider the quadratic function $f(x) = 3x^2 + 7x + 2$

a. What are the x-intercepts (written as points) of $f(x)$? $(-2, 0)$ & $(-\frac{1}{3}, 0)$

b. What is the y-intercept of $f(x)$? $(0, 2)$

41. Solve the quadratic equation: $-3(x+2)^2 = -30$ $x = -2 \pm \sqrt{10}$

42. What are the solutions of the quadratic equation: $f(x) = (x+5)(3x-7)$ $x = -5$ and $x = \frac{7}{3}$

43. Write a quadratic equation (in factored form) with solutions $\frac{3}{2}$ and 4 $y = (2x-3)(x-4)$

44. Find the value of c that makes each trinomial a perfect square:

a. $x^2 + 10x + c$ $c = 25$

b. $x^2 - 7x + c$ $c = \frac{49}{4}$

45. Rewrite each trinomial as a perfect square:

a. $x^2 + 18x + 81$ $(x+9)^2$

b. $x^2 - 4x + 4$ $(x-2)^2$

C 46. A rock is thrown upward so that its distance, in feet, above the ground after t seconds is $h(t) = -13t^2 + 312t$

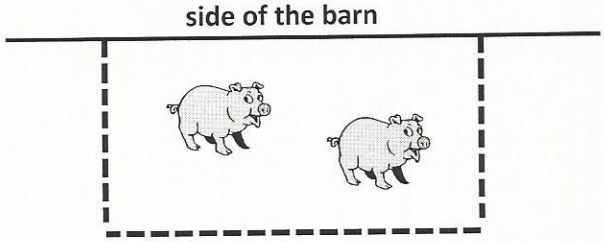
a. Find the **zeros** of the function and explain the meaning in the context of the problem. $(0,0)$ and $(24,0)$ are the zeros, The rock is on the ground...

b. Find the **vertex** of the function and explain the meaning in the context of the problem.
$(12, 1872)$ The rock is at its maximum height at 1872ft after 12 seconds.

47. A farmer is going to construct a rectangular pig pen. He could only afford 24 feet of fencing, so he is going to use the side of his barn in lieu of a 4th side to his fence. (See the picture for clarification.)

a. What should the dimensions of the pig pen be to **maximize** the area for his pigs?
6×12

b. What is the maximum area of the pig pen?
$72\ ft^2$



48. Find three consecutive integers such that the product of the first two plus the square of the third is 301.

11, 12 and 13

49. Determine if the quadratic expression is "quadratic in nature". Explain your reasoning.

a.) $3x^{\frac{2}{6}} + 10x^{\frac{1}{3}} + 8$ NO...

b.) $2x - \sqrt{x} - 1$ yes...

c.) $9(x+2)^2 - 16$ yes...

50. Factor the following polynomials:

a.) $8(x-1)^6+2(x-1)^3-15$ $(4(x-1)^3-5)(2(x-1)^3+3)$

b.) $3x^{\frac{2}{3}}+10x^{\frac{1}{3}}+8$ $(3x^{\frac{1}{3}}+4)(x^{\frac{1}{3}}+2)$

c.) $4x^8-20x^4+25$ $(2x^4-5)^2$

51. Simplify the following expressions:

a.) $\sqrt{-150}$ $5i\sqrt{6}$

b.) $i\sqrt{-54}$ $-3\sqrt{6}$

c.) i^{94} -1

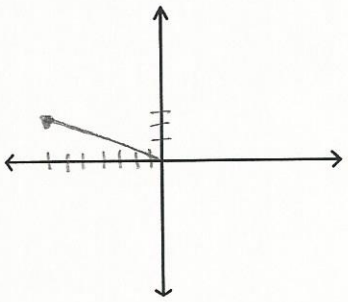
d.) $(6+4i)-(14-5i)$ $-8+9i$

e.) $(4-9i)^2$ $-65-72i$

f.) $\frac{3-2i}{1-3i}$ $\frac{9+7i}{10}$

52.) What is the conjugate of $-2-7i$? $-2+7i$

53. Draw the complex number on the complex plane and then find the modulus: $-7+3i$



54. Find the solution(s) to the following quadratic equations (using any method of choice, except graphing). Also, state the nature (rational, irrational, or complex) of the solutions.

a.) $x^2-16x+65=0$ $x=8\pm i$

b.) $11x^2+1=-7x$ $x=\frac{-7\pm\sqrt{5}}{22}$

c.) $x^2-2x-35=0$ $x=7, x=-5$

d.) $-2(x-1)^2=18$ $x=1\pm 3i$

The questions in this packet only cover units 1 through 5. Please refer to your unit 6 test for suggested study questions for unit 6.