Semester 2 Review Packet

Name: Key

Unit 6: Exponent Properties

Evaluate the following when $x = -2$

1) x^2 $(-2)^2$ 4

2) x^3 $(-2)^3$ -8

3) $(2x^2)^{-4}$ $2^{-4} \cdot (-2)^{-8}$ $\frac{1}{2^4 \cdot (-2)^8} = \frac{1}{16 \cdot 256} = \frac{1}{4096}$

Simplify the following expressions using properties of exponents. Answers must contain only positive exponents.

4) $-3 \cdot 3 \cdot x \cdot x \cdot y \cdot y \cdot y$ $-9x^2y^3$

5) $(3a^2c^3)(-7a^5c)$ $-21a^7c^4$

6) $2a^4b^{-8} \cdot 11b^3a^9$ $22a^{13}b^{-5} = \frac{22a^{13}}{b^5}$

7) $(5x^3)^2$ 5^2x^6 $25x^6$

8) $(-2x^{-4})^3$ $(-2)^3 \cdot x^{-12} = \frac{-8}{x^{12}}$

9) $6x^4 \cdot 5x^7$ $30x^{11}$

10) $4c(-3c^2)^2$ $4c \cdot (-3)^2 \cdot c^4$ $4c \cdot 9 \cdot c^4$ $36c^5$

11) $\frac{-3}{w^4(x^{-7})}$ $\frac{-3x^7}{w^4}$

12) $\frac{-3a^4b^{-2}}{-24a^8b^{-8}}$ $= \frac{-3a^4b^8}{-24a^8b^2}$ $= \frac{b^6}{8a^4}$

13) $(8x^2y)^0$ 1

14) $\frac{7^{-1}x^4}{2x^{-3}}$ $\frac{x^4 \cdot x^3}{2 \cdot 7} = \frac{x^7}{14}$

15) $\left(\frac{2a^2c^{-5}}{3ac^2}\right)^3$ $\left(\frac{2a}{3c^7}\right)^3 = \frac{2^3a^3}{3^3c^{21}} = \frac{8a^3}{27c^{21}}$

16) $\left(\frac{3}{7}\right)^{-2} = \frac{3^{-2}}{7^{-2}}$ $\frac{7^2}{3^2} = \frac{49}{9}$

17) $(2ac^2)^3(a^2c)^0(ac)^3$ $2^3a^3c^6 \cdot 1 \cdot a^3c^3$ $8a^6c^9$

18) $\frac{3m^3n}{4mn^5} \cdot \frac{4m^2n^3}{n}$ $= \frac{12m^5n^4}{4mn^6}$ $= \frac{3m^4}{n^2}$

Identify the following equations as exponential growth or decay.

19) $y = 12(.58)^x$ decay

20) $A = 4.5(2.33)^w$ growth

21) $y = \frac{3}{2}\left(\frac{5}{6}\right)^x$ decay

Growth Formula: $y = y_0(1+r)^t$
Decay Formula: $y = y_0(1-r)^t$

y =Amount at time, t
y_0 = Initial Amount
r = Growth/Decay rate

22) You deposit $500 in a bank account that pays 8% annual interest compounded yearly. What is the account balance after 6 years?

$y = 500(1+.08)^6$

$y = \$793.44$

23) You buy a computer for $3,000 that **depreciates** at a rate of 20% per year. Find the value of the computer after 5 years.

$y = 3000(1-.20)^5$

$y = \$983.04$

24) The concentration of aspirin in a person's bloodstream decreases by 20% each hour after taking a dose. If a person took 250 mg 6 hours ago, how much aspirin is left in his bloodstream now?

$y = 250(1-.20)^6$

$y = 65.54$ mg

Unit 7: Polynomials and factoring

Simplify the following.

1) $(2x+1)(3x-5)$

$6x^2 - 10x + 3x - 5$

$6x^2 - 7x - 5$

2) $4x^2\left(\frac{3}{2}x^2 + 5x - 9\right)$

$6x^4 + 20x^3 - 36x^2$

3) $6x - (8 - 3x)$

$6x - 8 + 3x$

$9x - 8$

4) $(4x-7) - 3(8x-11)$

$4x - 7 - 24x + 33$

$-20x + 26$

5) $(3x^3 - x^2 + 4x - 7) - 2(2x^3 - x + 8)$

$3x^3 - x^2 + 4x - 7 - 4x^3 + 2x - 16$

$-x^3 - x^2 + 6x - 23$

6) $(2a-3)(5a^2+10a-7)$

$10a^3 + 20a^2 - 14a - 15a^2 - 30a + 21$

$10a^3 + 5a^2 - 44a + 21$

7) $(7x-2)^2$

$(7x-2)(7x-2)$

$49x^2 - 14x - 14x + 4$

$49x^2 - 28x + 4$

Factor Completely. (Hint: Remember to look for the GCF *first*)

8) $8x - 24$

$8(x-3)$

9) $10x^2y^2 - 5xy^3$

$5xy^2(2x-y)$

10) $16a^2b^3 + 32a^3b - 8ab^4$

$8ab(2ab^2 + 4a^2 - b^3)$

11) $x^2 - 12x + 36$ add multiply

$(x-6)(x-6)$

12) $2x^2 + 7x + 6$ guess & check

$(2x+3)(x+2)$

13) $4x^2 - 49$ difference of 2 squares

$(2x+7)(2x-7)$

Factor Completely.

14) $100 - 121a^2$ difference of 2 squares

$(10-11a)(10+11a)$

15) $6x^2 + 21x - 45$

$3(2x^2+7x-15)$ guess & check

$3(2x-3)(x+5)$

16) $6x^3 - 9x^2 - 60x$

$3x(2x^2-3x-20)$

$3x(2x+5)(x-4)$

Unit 8: Solving Polynomials equations and graphing

Solve for x.

1) $(2x-7)(x+8)(x-2)=0$

$2x-7=0$ $x+8=0$ $x-2=0$

$x=\frac{7}{2}$ $x=-8$ $x=2$

2) $2x^2=6x$

$2x^2-6x=0$

$2x(x-3)=0$

$2x=0$ $x-3=0$

$x=0$ $x=3$

3) $x^2-5x=3x+33$

$x^2-8x-33=0$

$(x-11)(x+3)=0$

$x=11$ $x=-3$

4) $13x^2=-3x^3-4x$

$3x^3+13x^2+4x=0$

$x(3x^2+13x+4)=0$

$x(3x+1)(x+4)=0$

$x=0$ $x=-\frac{1}{3}$ $x=-4$

Discriminant!

$b^2-4ac>0$ 2 solutions

$b^2-4ac=0$ 1 solution

$b^2-4ac<0$ 0 solutions

How many solutions does the equation have?

5) $0=2x^2-4x+2$

$a=2, b=-4, c=2$

$d=(-4)^2-4(2)(2)=0$

1 SOLUTION

6) $10x^2-5x+1=0$

$a=10, b=-5, c=1$

$d=(-5)^2-4(10)(1)=-15$

NO SOLUTION

7) $-15x^2+3x+5=0$

$a=-15, b=3, c=5$

$d=(3)^2-4(-15)(5)=309$

2 SOLUTIONS

Solve the equations by using square roots.

8) $8y^2=968$

$y^2=121$

$y=\pm 11$

9) $\frac{1}{2}x^2-9=-1$

$\frac{1}{2}x^2=8$

$x^2=16$

$x=\pm 4$

10) $3x^2-17=x^2+81$

$2x^2=98$

$x^2=49$

$x=\pm 7$

11) $3x^2+18=0$

$3x^2=-18$

$x^2=-6$ *

NO SOLUTION

Provide the required information, and graph the function <u>WITHOUT YOUR CALCULATOR</u> on a separate sheet of graph paper.

12) $y=x^2-2x-3$

$x=\frac{2}{2(1)}=1$ / $y=1-2(1)-3$, $y=-4$

a. Opens up or down? up

b. Equation of axis of symmetry? $x=1$

c. Vertex? $(1,-4)$

d. y - intercept? $(0,-3)$

e. Zeros (x-Intercept)? $(x-3)(x+1)=0$, $x=3, x=-1$

f. Increasing Interval? $x\geq 1$ OR $[1,\infty)$

g. Decreasing Interval? $x\leq 1$ OR $(-\infty,1]$

13) $y=-2x^2-4x+3$

$x=\frac{4}{2(-2)}=-1$ / $y=-2(-1)^2-4(-1)+3$, $y=-2+4+3$, $y=5$

a. Opens up or down? down

b. Equation of axis symmetry? $x=-1$

c. Vertex? $(-1,5)$

d. y – intercept? $(0,3)$

e. Zeros (x-Intercept)? use quadratic formula $x=-2.58, x=.58$

f. Increasing Interval? $x\leq -1$ OR $(-\infty,-1]$

g. Decreasing Intervals? $x\geq -1$ OR $[-1,\infty)$

Complete the square to find the vertex.

14) $y = x^2 - 8x - 2$

$y = (x^2 - 8x + 16) - 2 - 16$

$y = (x-4)^2 - 18$

VERTEX = (4, −18)

15) $y = x^2 + 6x + 8$

$y = (x^2 + 6x + 9) + 8 - 9$

$y = (x+3)^2 - 1$

VERTEX = (−3, −1)

Use the height formula $h = -16t^2 + v_0t + h_0$ to solve the following problems.

16) A water balloon is dropped from a height of 64 feet. How many seconds will it take to hit the ground?

$0 = -16t^2 + 0t + 64$

$0 = -16t^2 + 64$

$0 = -(16t^2 - 64)$ difference of squares

$0 = -(4t+8)(4t-8)$

$t = \pm 2$

t = 2 seconds

17) A rock is thrown upward with an initial velocity of 56 feet per second. It leaves the thrower's hand 5 feet above the ground *(you may use your calculator).* $y = -16t^2 + 56t + 5$

a. How high will it go? vertex / maximum on the calculator

VERTEX = (1.75, 54)

54 ft

b. When will it hit the ground? zero on the calculator

$0 = -16t^2 + 56t + 5$

t = 3.59 sec

Write the Quadratic Formula here:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solve using the quadratic formula.

18) $2x^2 - 5x - 3 = 0$

$b^2 - 4ac = (-5)^2 - 4(2)(-3) = 49$

$x = \frac{5 \pm \sqrt{49}}{2(2)} = \frac{5 \pm 7}{4}$ → $\frac{5+7}{4} = \frac{12}{4} = 3$; → $\frac{5-7}{4} = \frac{-2}{4} = -\frac{1}{2}$

19) $-2x^2 + x = -6$ $\quad -2x^2 + x + 6 = 0$

$b^2 - 4ac = (1)^2 - 4(-2)(6) = 49$

$x = \frac{-1 \pm \sqrt{49}}{2(-2)} = \frac{-1 \pm 7}{-4}$ → $\frac{-1+7}{-4} = \frac{6}{-4} = -\frac{3}{2}$; → $\frac{-1-7}{-4} = \frac{-8}{-4} = 2$

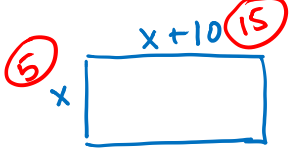
20) Find the x-intercepts of the graph of $y = 3x^2 + x - 4$ without using your calculator.

$y = (3x+4)(x-1)$ (factoring)

$3x + 4 = 0$ $\quad x - 1 = 0$

$x = -\frac{4}{3}$ $\quad x = 1$

21) We are going to fence in a rectangular field and we know that for some reason we want the field to have an enclosed area of 75 ft². We also know that we want the width of the field to be 10 feet longer than the length of the field. What are the dimensions of the field?



$x(x+10) = 75$

$x^2 + 10x - 75 = 0$

$(x+15)(x-5) = 0$

$x = -15, 5$

5 ft by 15 ft

Unit 9: Radicals

Simplify the radical completely

1) $4\sqrt{49}$

$4 \cdot 7$

28

2) $4\sqrt{27}$

$4 \cdot \sqrt{9}\sqrt{3}$

$4 \cdot 3 \cdot \sqrt{3}$

$12\sqrt{3}$

3) $\sqrt{\frac{99}{49}}$

$\frac{\sqrt{99}}{\sqrt{49}} = \frac{\sqrt{9}\sqrt{11}}{7} = \frac{3\sqrt{11}}{7}$

4) $\frac{\sqrt{18}}{\sqrt{8}} = \frac{\sqrt{9}}{\sqrt{4}} = \frac{3}{2}$

5) $3\sqrt{24x^3}$

$3 \cdot \sqrt{4}\sqrt{6}\sqrt{x^2}\sqrt{x}$

$3 \cdot 2 \cdot \sqrt{6} \cdot x \cdot \sqrt{x}$

$6x\sqrt{6x}$

6) $\sqrt{\frac{13}{8}} = \frac{\sqrt{13}}{\sqrt{4}\sqrt{2}} = \frac{\sqrt{13}}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{26}}{4}$ ($\sqrt{2} \cdot \sqrt{2} = 2$)

7) $2\sqrt{10} - 3\sqrt{40} + 4\sqrt{5}$ ($\sqrt{40} = \sqrt{4}\sqrt{10}$)

$2\sqrt{10} - 6\sqrt{10} + 4\sqrt{5}$

$-4\sqrt{10} + 4\sqrt{5}$

8) $-\sqrt{21}(4 - 2\sqrt{3})$ ($\sqrt{63} = \sqrt{9}\sqrt{7}$)

$-4\sqrt{21} + 2\sqrt{63}$

$-4\sqrt{21} + 6\sqrt{7}$

9) $\frac{8}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{8\sqrt{6}}{6} = \frac{4\sqrt{6}}{3}$

10) $(x - 2\sqrt{5})(x - \sqrt{5})$

$x^2 - x\sqrt{5} - 2x\sqrt{5} + 2\sqrt{25}$

$x^2 - 3x\sqrt{5} + 10$

11) $(2\sqrt{7} - 5)^2$

$(2\sqrt{7} - 5)(2\sqrt{7} - 5)$

$4\sqrt{49} - 10\sqrt{7} - 10\sqrt{7} + 25$

$28 - 20\sqrt{7} + 25$

$53 - 20\sqrt{7}$

Solve the following radical equations. Check for extraneous solutions.

12) $5 - \sqrt{4x - 3} = 3$

$-\sqrt{4x-3} = -2$

$(\sqrt{4x-3})^2 = (2)^2$

$4x - 3 = 4$

$4x = 7$

$x = \frac{7}{4}$ ★

13) $x = \sqrt{6 - 5x}$

$(\ )^2 = (\sqrt{6-5x})^2$

$x^2 = 6 - 5x$

$x^2 + 5x - 6 = 0$

$(x+6)(x-1) = 0$

$x = -6, \ x = 1$ ★

Unit 10: Stats

1) The temperatures (in °F) recorded at Pleasantville at noon on each day for two weeks were as follows:

81, 78, 77, 75, 82, 84, 78, 63, 71, 88

Are there any outliers? If so, prove it!

63, 71, 75, 77, 78, 78, 81, 82, 84, 88

MIN, Q1, MED, Q3, MAX

$IQR = 82 - 75 = 7$

$7(1.5) = 10.5$

$82 + 10.5 = 92.5$

$75 - 10.5 = 64.5$

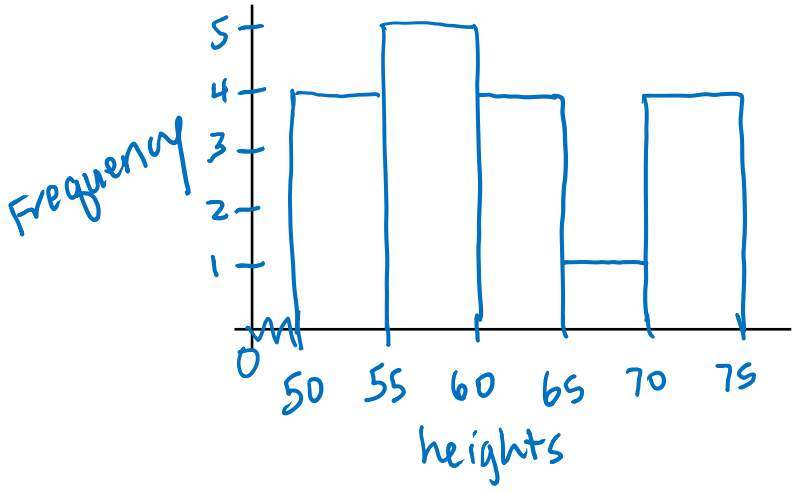
$64.5 \rightarrow 92.5$

★ 63 IS AN OUTLIER

2) The heights of 18 students in a class are listed below. Make a frequency table and a histogram to show the distribution of the heights.

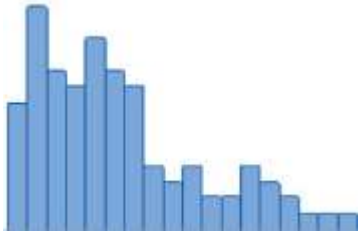
74 51 55 59 63 54 60 50 61 56 63 57 65 70 52 72 55 74

Height	Frequency
50-55	1111
55-60	+++
60-65	1111
65-70	1
70-75	1111



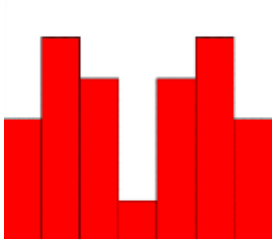
3) Describe the following distributions:

a.



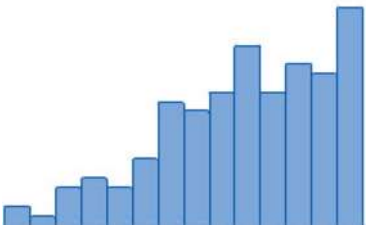
Skewed Right

b.



Symmetric (Bimodal)

c.



Skewed Left

4) Make a box and whisker plot for the following quiz scores on an Algebra class:

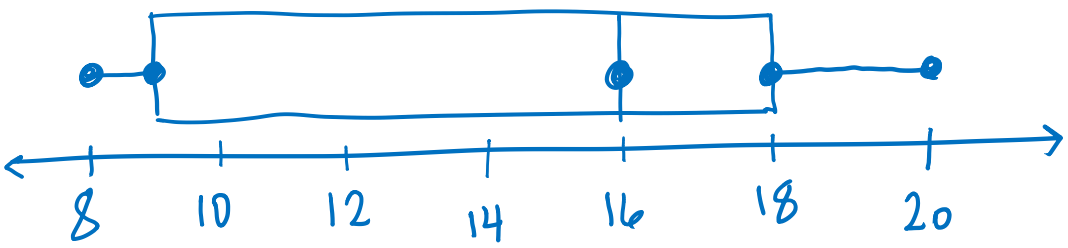
13, 18, 20, 11, 9, 18, 16, 9, 8, 19, 17

8 9 9 11 13 16 17 18 18 19 20

5 Number Summary:

Minimum	Q1	Median (Q2)	Q3	Maximum
8	9	16	18	20

Box and Whisker Plot:

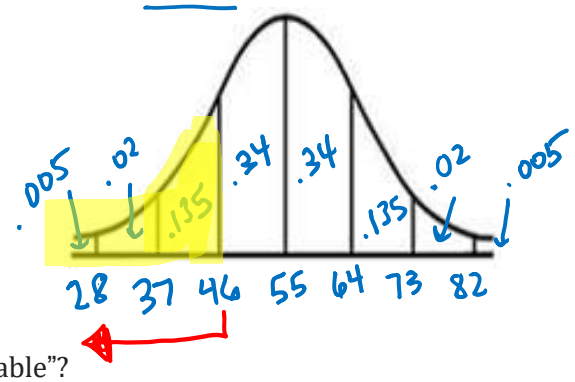


5) The weight of dogs at doggy day care center were recorded and follow a normal distribution. The mean weight was 55 pounds and the standard deviation was 9 pounds. What percent of dogs are less than 46 pounds?

$.135 + .02 + .005 = .16$

or

16%



Unit 11: Probability

1) How many ways can you arrange the letters in the word "uncopyrightable"?

$15 \cdot 14 \cdot 13 \cdot 12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 1.308 \times 10^{12}$

BIG NUMBER!

2) There are 25 marbles in a bag. 9 red, 8 blue, and 8 white.

a) If you choose 2 marbles **with** replacement, what is the probability they are blue and white?

$\frac{8}{25} \cdot \frac{8}{25} = \frac{64}{625}$

b) If you choose 3 marbles **without** replacement, what is the probability they are red, red, red?

$\frac{9}{25} \cdot \frac{8}{24} \cdot \frac{7}{23} = \frac{504}{13800} = \frac{21}{575}$

c) If you choose 1 marble, what is the probability it is red or blue?

$9 + 8$

$\frac{17}{25}$

3) The numbers 1-30 are written on pieces of paper. If you choose one randomly, what is the probability that you get a number that is less than 10 or a multiple of 5?

$\frac{9}{30} + \frac{6}{30} - \frac{1}{30} = \frac{14}{30} = \frac{7}{15}$

multiples of 5 that are less than 10

4) There is a 40% I remember to bring my umbrella on any given day. If I bring my umbrella, there is a 20% chance it will rain. If I forget my umbrella, there is a 75% chance it will rain. What is the probability on any given day that it will be sunny (not rain).

.40 umbrella → .20 rain
.80 no rain *
.60 no umbrella → .75 rain
.25 no rain *

$(.40)(.80) + (.60)(.25)$

$.32 + .15$

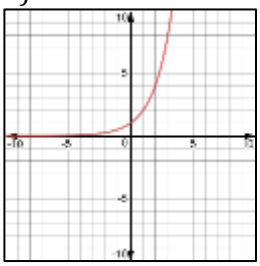
.47

Various Units: Transformations

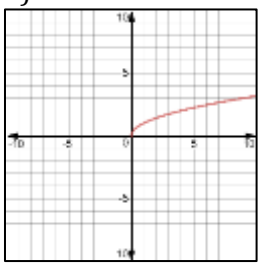
Match the equation of the parent function with the corresponding graph

C 1) $y = x^2$ A 2) $y = 2^x$ B 3) $y = \sqrt{x}$ D 4) $y = |x|$

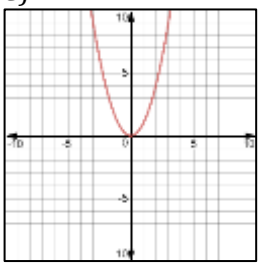
A)



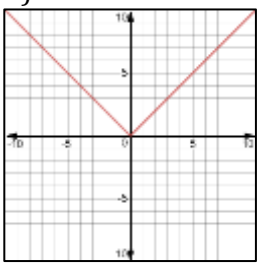
B)



C)



D)



5) For the following:

i.) Name the parent function and sketch a little graph of what it looks like.
ii.) Describe the transformations that will occur on that parent function.
iii.) SKETCH a quick graph of what the transformed function will look like.
iv.) State the domain and range
v.) State the end behavior

a. $y = (x + 2)^2 + 5$

i.) $y = x^2$ 

ii.) Left 2
Up 5

iii.) 

iv.) D: $\mathbb{R}$
R: $y \geq 5$ OR $[5, \infty)$

v.) as $x \to \infty, y \to \infty$
as $x \to -\infty, y \to \infty$

b. $y = \frac{1}{3}(x - 3)^2$

i.) $y = x^2$ 

ii.) Vert. shrink by 1/3
Right 3

iii.) 

iv.) D: $\mathbb{R}$
R: $y \geq 0$ OR $[0, \infty)$

v.) as $x \to \infty, y \to \infty$
as $x \to -\infty, y \to \infty$

c. $y = \sqrt{x - 7} + 3$

i.) $y = \sqrt{x}$ 

ii.) Right 7
Up 3

iii.) 

iv.) D: $x \geq 7$ OR $[7, \infty)$
R: $y \geq 3$ OR $[3, \infty)$

v.) as $x \to \infty, y \to \infty$
as $x \to -\infty, y \to \emptyset$