SEMESTER 1 MIDTERM EXAM REVIEW NAME Key

Multiple Choice (circle the correct answer)

1. The scores on the Weschler Intelligence Scale for Children (WISC) are normally distributed with a mean of 100 and a standard deviation of 15. What is the probability scoring 80 or greater?

A. 0.102 B. 0.908 C. 0.091 D. 0.000 E. Not enough information

normalcdf(80, 99999, 100, 15) ≈ .909

2. The heights of adult males is normally distributed with a mean of 70 inches and a standard deviation of 4 inches. If a male is randomly selected from the population, what is the probability that the male is between 67 and 76 inches tall?

A. 0.706 B. 0.773 C. 0.668 D. 0.933 E. Correct answer not given

$P(67 \le X \le 76)$ = normalcdf(67, 76, 70, 4) ≈ .707

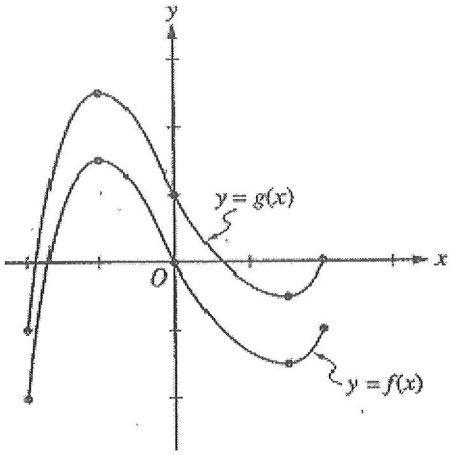
3. A local pharmacist for the Cleveland Clinic has developed a pill that she believes will improve memory and retention of information. In order to test if her pill works, the pharmacist randomly selects 5,000 local high school students to participate in her study (for the purposes of this question, we will overlook the ethical problems with forcing people to participate in a medical study). The pharmacist randomly divides the students into two groups, gives one group the real pill and the other group a placebo. She then has other trained experimentors administer a test of memory and retention. The trained experimenters do not know if the subjects were given the real pill or the placebo. In analuyzing the data, the pharmacist finds that the experimental group scores a statistically significant amount higher. Based the description of this experiment:

A. This experiment is not a well-designed experiment
B. The placebo effect could be affecting the outcome of this experiment
C. The experiment could be improved if it were made double blind.
D. The pharmacist can generalize her results to the entire population
E. The pharmacist can generalize her results to only high school students

4. You take the SAT and score in the 85th percentile. This information tells you:

A. You got 85% of the problems on the SAT correct.
B. 85% of students scored the same as you.
C. 85% of students scored the same or higher than you.
D. 85% of students scored the same or lower than you.
E. None of the above.

5. The graphs of the functions f and g in the interval from $x = -2$ to $x = 2$ are shown above. Which of the following could express g in terms of f?



$g(x) = f(x)+1$

(A) $g(x) = f(x+1)$

(B) $g(x) = f(x)+1$

(C) $g(x) = f(x+1)+1$

(D) $g(x) = f(x-1)$

(E) $g(x) = f(x)-1$

6. When a function is reflected over the x-axis, the coordinates of the point (a,b) become

(A) $(a,-b)$

(B) $(-a,b)$

(C) $(-a,-b)$

(D) (a,b)

7. The three zeroes of the equation $f(x)$ are $x=-2,0,$ and 3.

Therefore, the three zeroes of the equation $f(x-2)=0$ are:

MOVED RIGHT 2

(A) $x=-4,-2,$ and 1

(B) $x=-2,0,$ and 3

(C) $x=4,2,$ and 5

(D) $x=0,2,$ and 5

8. If $f(x)=|x|$ and $g(x)=-|x+2|$, how is $f(x)$ transformed to get $g(x)$?

(A) $f(x)$ is reflected over the x-axis and translated up 2 units.

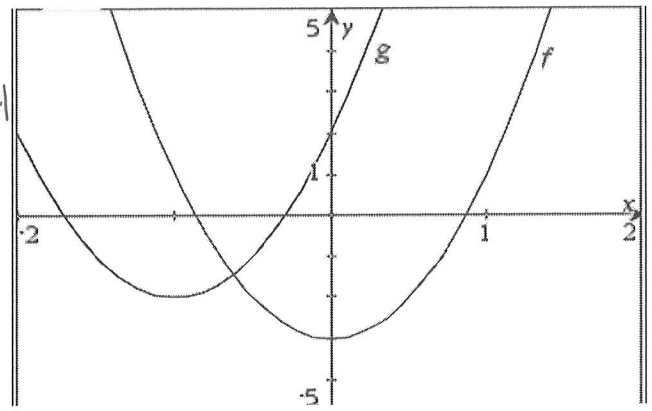
(B) $f(x)$ is reflected over the x-axis and translated right 2 units.

(C) $f(x)$ is reflected over the x-axis and translated left 2 units.

(D) $f(x)$ is translated right 2 units and translated down 1 unit.

9. The graphs of the functions f and g in the interval from $x = -2$ to $x = 2$ are shown above. Which of the following could express g in terms of f?

(A) $g(x) = f(x+1)$
(B) $g(x) = f(x)+1$ $g(x) = f(x+1)+1$
(C) $g(x) = f(x+1)+1$
(D) $g(x) = f(x-1)$
(E) $g(x) = f(x)-1$



Use the following information for problems 10 and 11.
The graph of $f(x)$ has the following characteristics:

x-intercepts:	$(-6,0)$, $(-2,0)$, and $(3,0)$
y-intercept:	$(0,7)$
local min/max:	$(1,8)$ and $(-5,-2)$
	Max Min

10. If $g(x) = -f(x)+1$, what is the local minimum of $g(x)$

flip over x-axis, Translate up 1

$(x,y) \rightarrow (x, -y+1)$

(A) $(-5,3)$
(B) $(5,-1)$
(C) $(-1,9)$
(D) $(1,-7)$

Transform local Maximum Due to Reflection

$(1,8) \Rightarrow (1,-7)$

11. If $h(x) = f(x+5)-3$, what is the y-intercept of $h(x)$

left 5 Down 3

$(0,7) \Rightarrow (-5,4)$

(A) $(0,-5)$
(B) $(0,4)$
(C) $(-5,4)$
(D) Cannot be determined from the given information

Use the following characteristics about $f(x)$ to answer questions 12-17

- local maximum at $(1,6)$; local minimum at $(3,4)$
- zero at $x=-2$
- y-intercept at $(0,5)$

12. If $g(x)=3\cdot f(x)$, what is the y-intercept of $g(x)$?

VERTICAL STRETCH of 3 $(x,y)\to(x,3y)$

(A) $(0,5)$ (B) $(0,15)$ (C) $\left(0,\frac{5}{3}\right)$ (D) $(0,8)$ (E) Can't be determined.

$(0,5)\to(0,15)$

13. If $g(x)=3\cdot f(x)$, what is the zero of $g(x)$?

$(-2,0)\to(-2,0)$

(A) $x=-2$ (B) $x=-6$ (C) $x=-\frac{2}{3}$ (D) $x=1$ (E) Can't be determined

14. If $g(x)=f\left(\frac{1}{2}x\right)$, what is the local minimum of $g(x)$?

HORIZ STRETCH of 2. $(x,y)\to(2x,y)$

(A) $(3,2)$ (B) $(3,8)$ (C) $\left(\frac{3}{2},4\right)$ (D) $(6,4)$ (E) Can't be determined

MIN → MIN no flip

$(3,4)\to(6,4)$

15. If $g(x)=f\left(\frac{1}{2}x\right)$, what is the zero of $g(x)$?

(A) $x=-2$ (B) $x=-1$ (C) $x=-4$ (D) $x=0$ (E) Can't be determined

$(-2,0)\to(-4,0)$

16. If $g(x)=f(x-3)+2$, what is the y-intercept of $g(x)$?

RIGHT 3, UP 2

(A) $(3,7)$ (B) $(-3,7)$ (C) $(0,7)$ (D) $(0,5)$ (E) Can't be determined

$(x,y)\to(x+3,y+2)$

$(0,5)\to(3,7)$ ← not a y-int

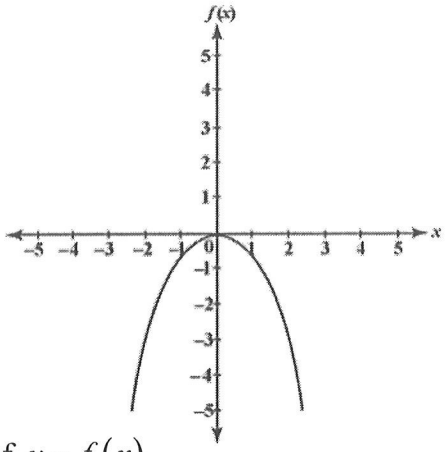
17. If $g(x)=f(2x)+1$, what is the local maximum of $g(x)$?

(A) $\left(\frac{1}{2},5\right)$ (B) $(2,5)$ (C) $(2,7)$ (D) $\left(\frac{1}{2},7\right)$ (E) Can't be determined

$(x,y)\to\left(\frac{1}{2}x,y+1\right)$

$(1,6)\to(.5,7)$

18.

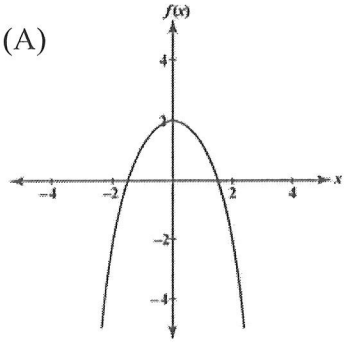


Shown above is the graph of $y = f(x)$.

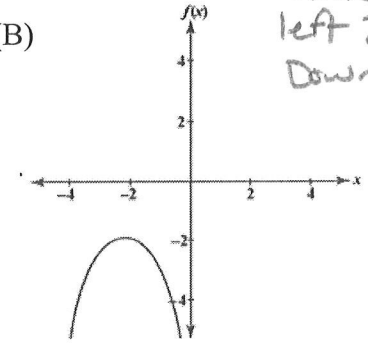
Which of the following could be the graph of $y = -f(x+2) - 2$

Reflected over X
left 2
Down 2

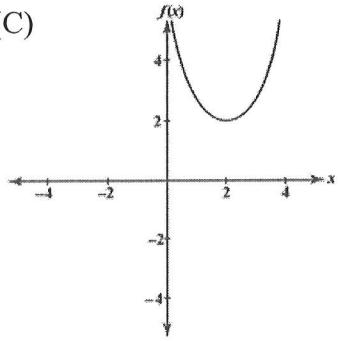
(A)



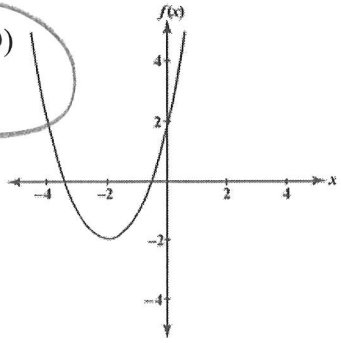
(B)



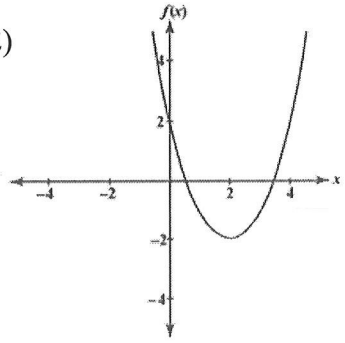
(C)



(D)



(E)



1a. What does the symbol μ stand for? The Population MEAN

1b. What does the symbol σ stand for? The Population Standard Deviation.

2. What are the three characteristics of a well designed experiment? Hint: *Look at your Lesson 1-2 notes (Beaker Page).*

1.) Random Assignment of Treatments to Subjects.

2.) Sufficient number of subjects.

3.) The experiment has a control Group or Comparison Grop.

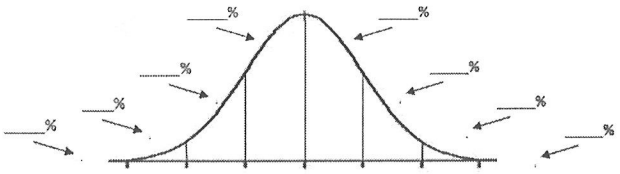
3. Given a normal distribution curve, give the percent of the data that lies…
Hint: *Look at your Lesson 1-4 notes (Nickel Page).*

a.) Within 1 Standard Deviation: 68%

b.) Within 2 Standard Deviations: 95%

c.) Within 3 Standard Deviations: 99.7%

d.) Fill in the percentages between the lines.



4. What is a placebo? A treatment given that is believed to be special attention or special treatment to cause a certain response.

5. What is a subject blind experiment? Evaluator blind experiment? Double Blind experiment?

Subject Blind: when the subjects Do not know which treatments they are getting. Evaluator Blind: The evaluators Do not know which Treatments the subjects got. Double Blind: neither Evaluator nor subjects knows who got which Treatments.

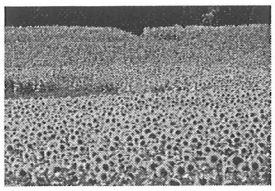
6. In order for the results of an experiment to be considered **statistically significant**, the probability that a difference in our data being due to random chance alone must be less than or equal to 5 %.

7. In a well designed experiment, what is a control group? What is a comparison group?

Control Group: The group that gets no treatment. The other would get a Treatment.

Comparison Group: A Group from an experiment where 2 Groups are given different treatments.

Ms. McGarry wants to grow giant sunflowers on her sunflower farm. She chooses 1500 sunflowers to apply a growth hormone to. She intentionally does not apply it to another 1500 sunflowers she selected. She hires Sally to measure the size of the sunflowers. Sally is unaware of which sunflowers have been treated.



8a.) Does Ms. McGarry study have the three characteristics of a well-designed experiment?

☑ Sufficient number of subjects
☒ Random Assignment of Treatments to subjects.
☑ Control Group or Comparison Group

8b.) What are the treatments? What is the response variable?

Treatments: Growth Hormone vs. No growth Hormone.
Response variable: Size of sunflowers

Treatments: _____ vs. _____

Response Variable: SEE ABOVE ~~vs~~ _____

8c.) Is Ms. McGarry's experiment Subject Blind? Evaluator Blind? Double Blind? Explain.

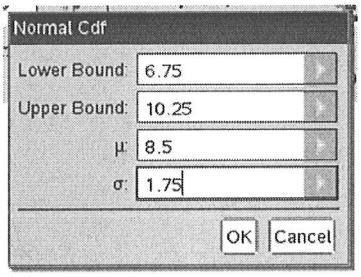
This is a Double Blind experiment Because the evaluator Does not know which seeds got which treatment. The seeds are not people so they cannot know which treatment they got and then act Differently.

8d.) Could there be any lurking variables in his study?

- How much they were watered or where they were planted.

In Unit 1, we learned how to do a Normal CDF on the TI-NSPIRE to calculate such things as percentiles and probability.

The amount of time that Julio plays Angry Birds in any given week is normally distributed. If Julio plays ~~Words with Friends~~ Angry Birds an average of 8.5 hours per week, with a standard deviation of 1.75 hours, what is the probability of Julio playing ~~Words with Friends~~ Angry Birds between 6.75 and 10.25 hours a week? To answer this question using Normal CDF, all we need to know is the: Lower Bound, Upper Bound, Mean μ, and Standard Deviation σ. To get Normal CDF on your calculator, go to the Scratchpad and select MENU, 5, 5, 2.



In the questions below, show your set-up (what you typed in the calculator) and your answer.

9a.) What is the probability that Julio will play Angry Birds between 6.75 and 10.25 hours per week?

normCdf(6.75, 10.25, 8.5, 1.75) ≈ .683

9b.) Does your answer to 9a. make sense? *Think about your answer to #3.*

YES. About 68% of the Data should be within 1 standard of the mean.

9c.) What is the probability that Julio will play Angry Birds between 1 and 12 hours per week?

NormCdf(1, 12, 8.5, 1.75) ≈ .977

9d.) What is the probability that Julio will play Angry Birds less than 9 hours per week?

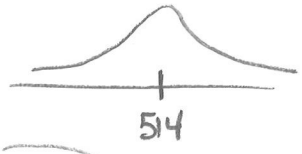
NormCdf(-999, 9, 8.5, 1.75) ≈ .612

9e.) What is the probability that Julio will play Angry Birds at least 8 hours per week?

NormCdf(8, 99999, 8.5, 1.75) ≈ .612

In 2013, the mean score on the Math SAT was 514 with a standard deviation of 110.

In the questions below, show your set-up (what you typed in the calculator) and your answer.



10a.) A student scores a 530. What percentile is the student in?

$P(X \leq 530) = \text{NormalCdf}(-99999, 530, 514, 110) \approx .558$

10b.) What is the probability that a student will score a 500 or less?

$P(X \leq 500) = \text{NormalCdf}(-99999, 500, 514, 110) \approx .449$

10c.) What is the probability that a student will score a 550 or less?

$P(X \leq 550) = \text{NormalCdf}(-99999, 550, 514, 110) \approx .628$

10d.) What is the probability that a student will score at least a 600?

$P(X \geq 600) = \text{NormalCdf}(600, 99999, 514, 110) \approx .217$

10e.) Johnny scores a 404. What is his standardized score (z-score)?

$z = \frac{X - \mu}{\sigma} = \frac{\text{Value} - \text{Mean}}{\text{Standard Dev}} = \frac{404 - 514}{110} = \frac{-110}{110} = -1$

10f.) Ari scores a 700. What is her standardized score (z-score)?

$= \frac{700 - 514}{110} = \frac{186}{110} \approx 1.69$

$z \approx 1.69$

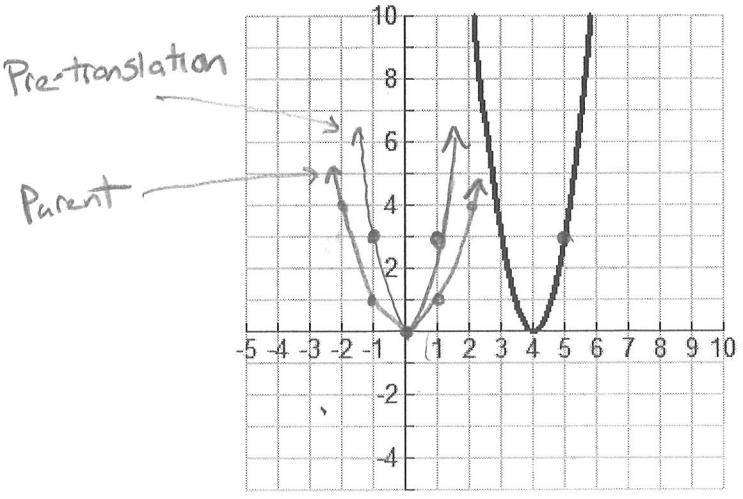
$z = -1$

1 Standard Deviation Below average

10g.) Explain what the standardized score (z-score) represents.

How many standard deviations a value is above or Below the Mean.

11. Write the equation for the following graph.



Parent x^2, Parent is Translated Right 4 And is vertically stretched

Parent → Given Graph

$(1,1) \rightarrow (1,3)$

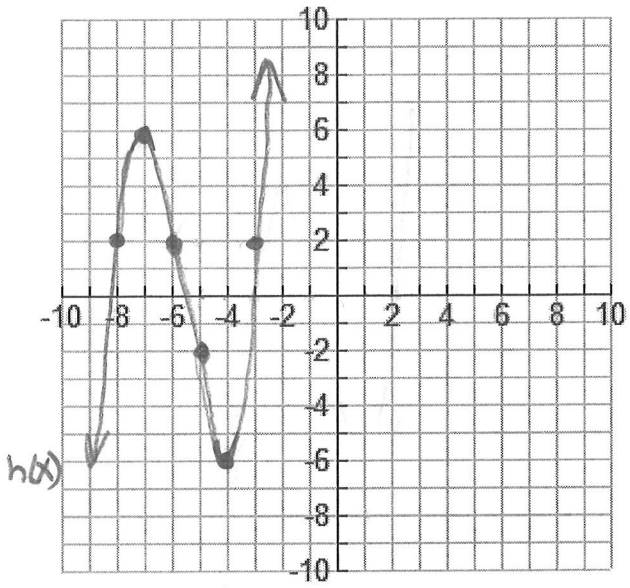
Vertical Stretch of 3

$y = (x \quad)^2$

$y = 3(x-4)^2$

Use the following characteristics of $g(x)$ to answer questions about $h(x)$ in questions *12-14*

- local minimum at (1, -8)
- local maximum as (-2, 4)
- zeroes at -3, -1, 2
- y-intercept at (0, -4)



12. If $h(x) = g(x+5)+2$ draw a sketch of *h(x)*

left 5, up 2

$(x,y) \rightarrow (x-5, y+2)$

$(1,-8) \rightarrow (-4,-6)$

$(-2,4) \rightarrow (-7,6)$

$(0,-4) \rightarrow (-5,-2)$

$(-3,0) \rightarrow (-8,2)$

$(-1,0) \rightarrow (-6,2)$

$(2,0) \rightarrow (-3,2)$

Local minimum: $(-4,-6)$ Local maximum: $(-7,6)$

Zeroes: CBD y-intercept: CBD

13. If $h(x) = -\frac{1}{2}g(x)$, describe the transformation that is happening, then give the new characteristics.

Description: Reflect over X-axis, Vertically Compress by $\frac{1}{2}$

$(x,y) \rightarrow (x, -\frac{1}{2}y)$

$(-2,4) \rightarrow (-2,-2)$

$(1,-8) \rightarrow (1,4)$

Local minimum: $(-2,-2)$ Transform MAX Local maximum: $(1,4)$ Transform MIN

Zeroes: $-3, -1$ and 2 y-intercept: $(0,2)$

$(-3,0) \rightarrow (-3,0)$

$(0,-4) \rightarrow (0,2)$

14. If $h(x) = g(4x) - 3$, describe the transformations that are happening, then give the new characteristics.

Description: horizontal Compression of $\frac{1}{4}$, Translated Down 3

$(x,y) \rightarrow (\frac{1}{4}x, y-3)$

$(1,-8) \rightarrow (\frac{1}{4}, -11)$

$(-2,4) \rightarrow (-\frac{1}{2}, 1)$

Local minimum: $(\frac{1}{4}, -11)$ Local maximum: $(-\frac{1}{2}, 1)$

Zeroes: CBD y-intercept: $(0,-7)$

$(-3,0) \rightarrow (\frac{-3}{4}, -3)$

$(0,-4) \rightarrow (0,-7)$

15. **REWORK ALL PROBLEMS FROM PREVIOUS ASSESSMENTS IN UNITS 1-3.**
Note that no material from Unit 3 is on this review – be sure to review the assessments!!

OK