Adv. Functions – Rev for Final: Packet #3 (Part of Spring '14 Exam)

Key cont'd

1 A

Suppose the function $H(t) = 8.5\sin(0.017t - 1.35) + 12$ models the hours of sunlight for a town in Alaska, where $t = 1$ is the first day of the year. Based on the function, what is the ***approximate*** range of daylight hours for the town?

(A) 3.5 to 20.5

B 4 to 20

C 4.5 to 19.5

D 5 to 19

high = 8.5 + 12 = 20.5

low = −8.5 + 12 = 3.5

2 B

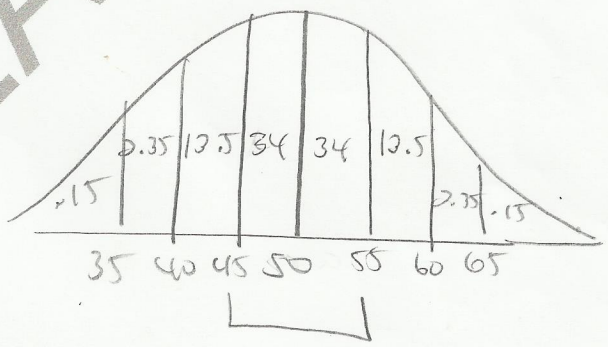
The lifetime of a particular type of car tire is normally distributed. The mean lifetime is 50,000 miles, with a standard deviation of 5,000 miles. Of a random sample of 15,000 tires, how many of the tires are expected to last for between 45,000 and 55,000 miles?

A 7,125

(B) 10,200

C 14,250

D 14,850



34 + 34 = 68%

.68(15000) = 10,200

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keycontd

3 The frequency table below shows the number of runners in specific age groups for a certain race.

B

Age Group	Number of Runners
0–10	||
11–20	|
21–30	𝍸 𝍸 ||
31–40	𝍸 |
41–50	𝍸
51–60	|
61–70	||
71–80	|
81–90	||

What is the shape of the distribution?

A uniform

(B) skewed right

C skewed left

D normal

key control

4 A spinner labeled 1 to 9 gives each of the numbers 2, 5, 7, and 9 a $\frac{3}{20}$ chance of being landed upon. The chance of landing on each of the other five numbers is equal. If the spinner is spun 1,000 times, which choice is the ***most likely*** outcome for the 1,000 spins?

$\frac{3}{20} = .15$

B

A

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	110	112	111	111	109	112	112	111	112

B

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	82	148	78	80	149	79	151	81	152

$= \frac{148}{1000} = .148$ $= \frac{149}{1000} = .148$ $= \frac{151}{1000} = .151$ $= \frac{152}{1000} = .152$

C

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	120	122	100	103	108	126	113	104	104

D

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	121	100	119	120	102	120	98	121	99

key control

5 A group of 12 people need to form a line. The line will consist of exactly 9 of the people. Person X and Person Y have to be either third or fourth in line. How many different orders are possible?

B

A 79,833,600

B 1,209,600

C 604,800

D 362,880

$10 \times 9 \times \boxed{2 \times 1} \times 8 \times 7 \times 6 \times 5 \times 4$

1 2 3 4 5 6 7 8 9

6 The probability that it will rain on Saturday is $\frac{2}{3}$. The probability that the temperature on Saturday will reach 100°F is $\frac{4}{9}$. The probability that it will rain or reach 100°F on Saturday is $\frac{4}{5}$. What is the probability it will rain and reach 100°F on Saturday?

A

A $\frac{14}{45}$

B $\frac{16}{45}$

C $\frac{24}{45}$

D $\frac{26}{45}$

$P(\text{rain on Sat}) = \frac{2}{3}$ (A)

$P(\text{Sat} = 100°F) = \frac{4}{9}$ (B)

$P(\text{will rain or} = 100°F \text{ on Sat}) = \frac{4}{5}$

$P(\text{rain or temp.}) = P(\text{rain}) + P(\text{temp}) - P(\text{rain and temp})$

$\frac{4}{5} = \frac{2}{3} + \frac{4}{9} - x$

$\frac{4}{5} = \frac{10}{9} - x$

$-\frac{10}{9} \quad -\frac{10}{9}$

$\frac{-14}{45} = \frac{-x}{-1} \rightarrow \boxed{x = \frac{14}{45}}$

$\frac{-1}{-1}$

key control

7 A manufacturing plant produces a special kind of lightbulb.

A

- Each lightbulb produced has a 0.040 probability of being defective.
- Five lightbulbs are chosen at random from the production line.

To the nearest thousandth, what is the probability that exactly two of the five bulbs will be defective?

(A) 0.014

B 0.016

C 0.018

D 0.020

P(exactly 2 bulbs are defective)

$5C_2(.04)^2(.96)^3$

$= .014$

8 What is the meaning of the base of the function $y = -\log(x)$?

A

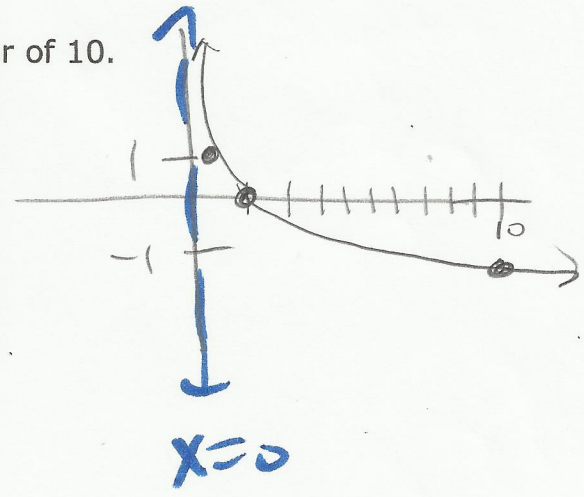
(A) As y decreases by 1, x increases by a factor of 10.

B ~~As y decreases by 1, x increases by 10.~~ no sense

C As y increases by 1, x increases by a factor of 10.

D ~~As y increases by 1, x increases by 10.~~ no sense

understood base = 10

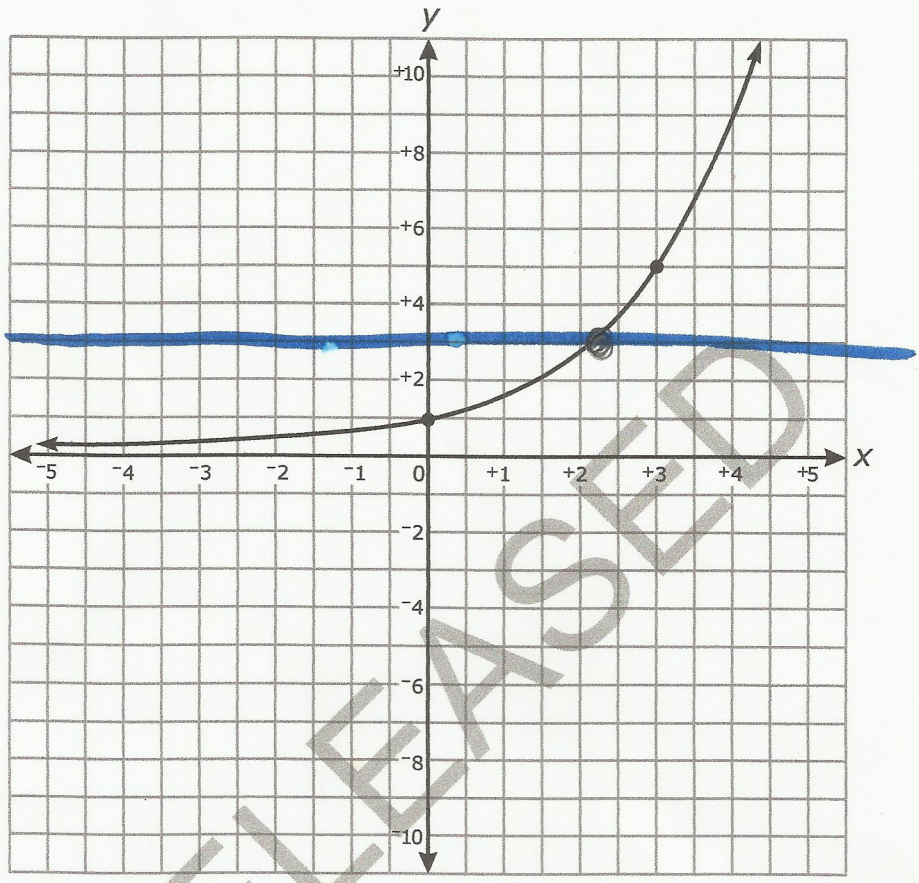


X=0

Key cont'd

9 The graph of $y = a^x$ is shown below.

B



Which choice is closest to $\log_a 3$?

$x=3$ so or graph look at $y=3$

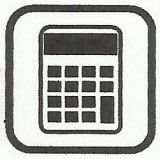
A 0.9

B 2.1

C 3.2

D 4.8

key cont'd



10 A piecewise function is shown below.

B

$$h(x) = \begin{cases} -2x^2 + 5x + 10 & \text{for } -4 \le x \le 3 \\ 2x + 3p & \text{for } 3 \le x \le 5 \end{cases}$$

need = to be continuous

For what value of p will the function be continuous?

A $\frac{10}{3}$

B $\frac{1}{3}$

C $\frac{-25}{3}$

D $\frac{-34}{3}$

$h(3) = -2(3)^2 + 5(3) + 10 = 7$

$2x + 3p = 7$

$2(3) + 3p = 7$

$6 + 3p = 7$

$-6 \quad -6$

$3p = 1$

$\frac{3p}{3} = \frac{1}{3}$

$p = \frac{1}{3}$

11 The equation $y = 4.7x^{\frac{1}{6}}$ is graphed on the coordinate plane. How does increasing the denominator of the exponent transform the graph?

C

A The transformed graph will approach a horizontal asymptote while the original graph will not.

B The transformed graph will not approach a horizontal asymptote while the original graph will.

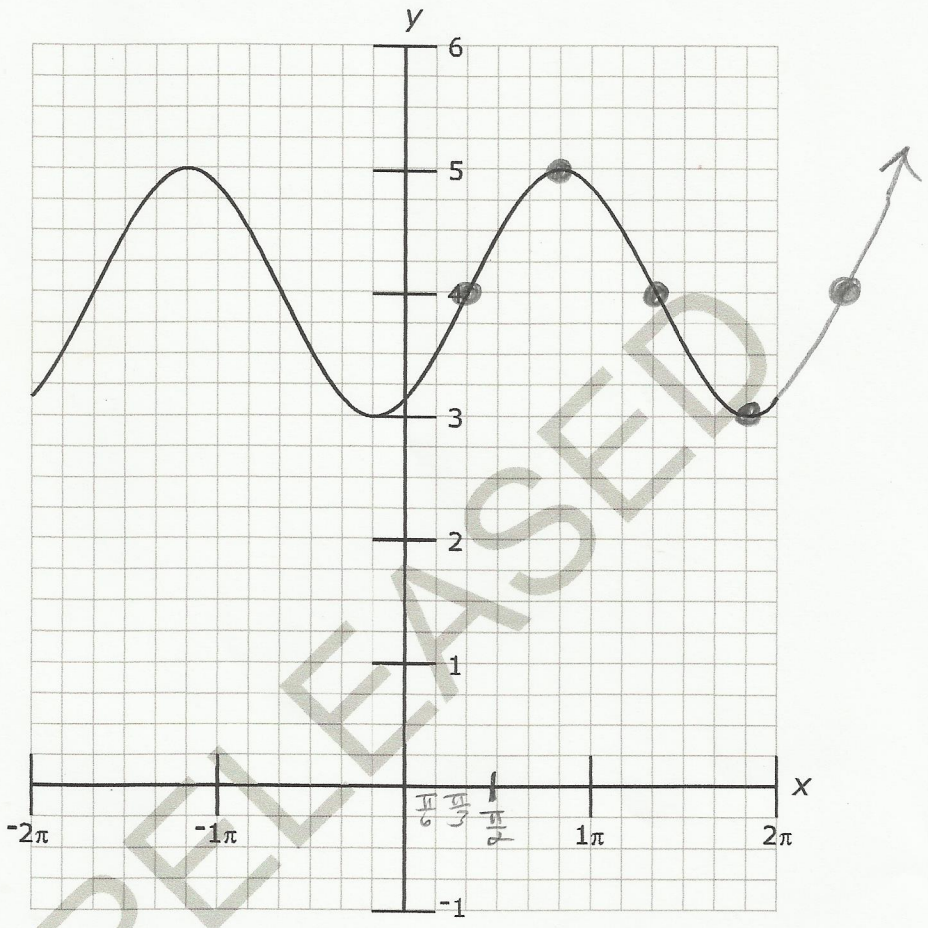
C The transformed graph will go to ∞ slower than the original graph as the value of x gets larger.

D The transformed graph will go to ∞ faster than the original graph as the value of x gets larger.

Key control

12 Which function correctly represents the graph below?

A



A $y = \sin\left(x - \frac{\pi}{3}\right) + 4$

B $y = \sin\left(x + \frac{\pi}{3}\right) + 4$

C $y = \cos\left(x - \frac{\pi}{3}\right) + 4$

D $y = \cos\left(x + \frac{\pi}{3}\right) + 4$

Go to the next page.

13 Which function has an amplitude that is twice the size and a period that is three times the size of the function $y = 3\cos\left(\frac{x}{4} - 1\right) + 2$?

A

(A) $y = 6\sin\left(\frac{x}{12} - 3\right) + 1$

amp = 3 × 2 = 6

period = $\frac{2\pi}{\frac{1}{4}} = 8\pi \times 3 = 24\pi$

$b = \frac{2\pi}{24\pi}$

$b = \frac{1}{12}$

no sense ~~(B)~~ $y = \frac{3}{2}\cos\left(\frac{3x}{4} + 1\right) - 3$

(C) $y = 6\cos\left(\frac{3x}{4} - 1\right) + 3$

no sense ~~(D)~~ $y = \frac{3}{2}\sin\left(\frac{x}{12} + 3\right) - 1$

14 A plane takes off and travels at an angle of 40° north of east at 110 mph for 2 hours. It then adjusts its path to head 10° west of north and travels in that direction for half an hour at a speed of 100 mph. ***Approximately*** how far away is the plane from its starting point?

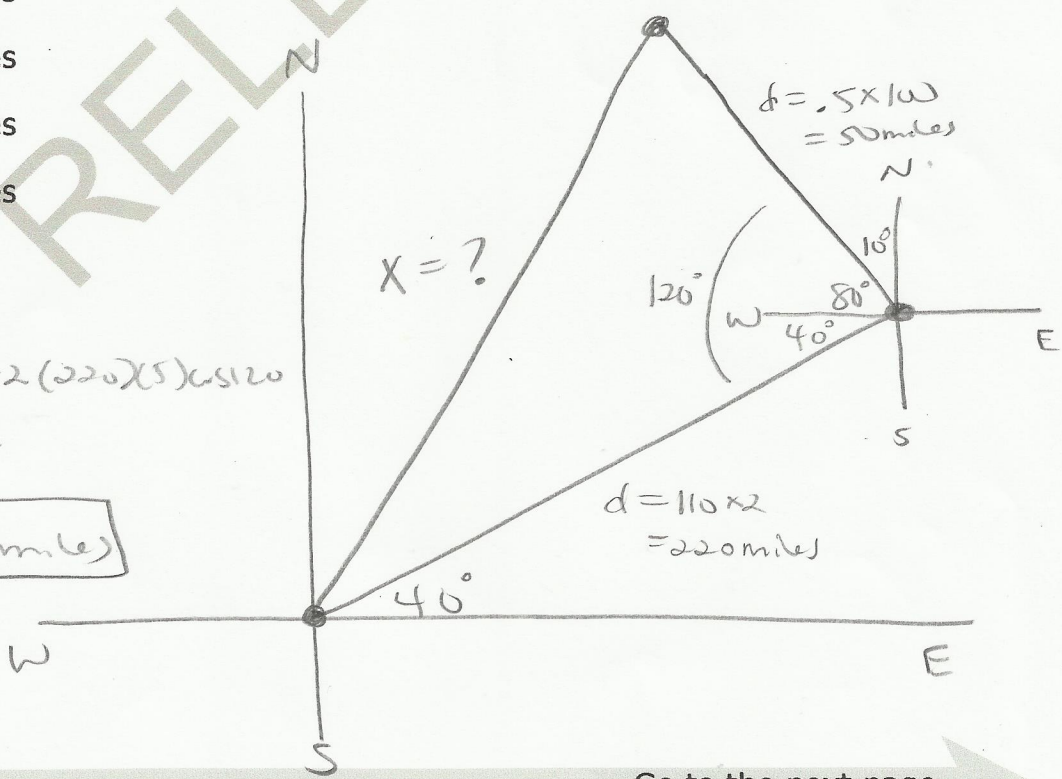
D

A 182 miles

B 200 miles

C 238 miles

(D) 249 miles



$X^2 = 220^2 + 50^2 - 2(220)(50)\cos 120$

$X = 248.8$

$\approx$ 249 miles

15 Which statement is true about the fifth terms of the two sequences below?

$a_n = 3n^2 - 6$

$b_n = 3(b_{n-1} - 6);\ b_1 = 10$

A The fifth term of the recursive sequence exceeds the fifth term of the explicit sequence by 63.

B The fifth term of the explicit sequence exceeds the fifth term of the recursive sequence by 63.

C The fifth term of the recursive sequence exceeds the fifth term of the explicit sequence by 21.

D The fifth term of the explicit sequence exceeds the fifth term of the recursive sequence by 21.

16 Which statement is true about the series shown below?

$$-4 + -2 + -1 + \frac{-1}{2} + \frac{-1}{4} + \ldots$$

A The series converges because $|r| < 1$.

B The series diverges because $|r| < 1$.

C The series converges because $|r| > 1$.

D The series diverges because $|r| > 1$.

key control

17 What is the explicit form of the equation $a_n = a_{n-1} + 2(n - 1)$; $a_1 = 1$?

A $a_n = 2n - 1$ $a_1=2(1)-1=1$, $a_2=2(2)-1=3$, $a_3=2(3)-1=5$ $a_2 = 1+2(2-1)=3$ $a_3=3+2(3-1)=7$

B $a_n = n^2 - n + 1$ $a_1=1^2-1+1=1$, $a_2=2^2-2+1=3$, $a_3=3^2-3+1=7$

C $a_n = n^2 - 2n + 2$ $a_1=1^2-2(1)+2=1$, $a_2=2^2-2(2)+2=2$

D $a_n = 2n^2 - 2n - 1$ $a_1=2(1)^2-2(1)-1=-1$

$a_n=2n-1$	$a_n=n^2-n+1$	$a_n=n^2-2n+2$	$a_n=2n^2-2n-1$
$a_1=2(1)-1=1$	$a_1=1^2-1+1=1$	$a_1=1^2-2(1)+2=1$	$a_1=2(1)^2-2(1)-1=-1$
$a_2=2(2)-1=3$	$a_2=2^2-2+1=3$	$a_2=2^2-2(2)+2=2$	
$a_3=2(3)-1=5$	$a_3=3^2-3+1=7$		