Name: _____

Instructor: _____

Math 10120, Exam 3,
November 18, 2014

- The Honor Code is in effect for this examination. All work is to be your own.
- Please turn off all cellphones and electronic devices.
- Calculators **are** allowed
- The exam lasts for 1 hour and 15 minutes.
- Be sure that your name and your instructor's name are on the front page of your exam.
- Be sure that you have all 13 pages of the test.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

Please do NOT write in this box.

Multiple Choice _____

11. _____

12. _____

13. _____

15. _____

Total _____

Multiple Choice

1.(5pts) The daily high temperatures (in degrees Fahrenheit) one week in February were 20, 15, 19, 25, 24, 13, and 17. Find the median.

(a) 19.5   (b) 19   (c) 20

(d) 17   (e) 18.5

2.(5pts) On a 20 point quiz with each multiple choice problem worth 5 points, a class had the following scores

# Score	Frequency
0	3
5	4
10	10
15	25
20	8

The population mean is 13.1. Find the population standard deviation to two decimal places.

(a) 5.19   (b) 7.23   (c) 2.46   (d) 4.38   (e) 6.12

3.(5pts) The probability distribution of the random variable X is shown in the accompanying table.

x	0	5	10	15	20
P($X = x$)	0.21	0.16	0.18	0.21	0.24

Which statement (a)-(e) is correct?

(a) $P(X \geqslant 10) = 0.55$ 　　　　　　　　　　　(b) $P(X \geqslant 10) = 0.18$

(c) $P(X \geqslant 10) = 0.211$ 　　　　　　　　　(d) $P(X \geqslant 10) = 0.82$

(e) $P(X \geqslant 10) = 0.63$

4.(5pts) A sample of 4 elements x_1, x_2, x_3 and x_4 is taken from a population of $1,000,000$ elements. Which formula gives the sample standard deviation?

$\bar{x}$ denotes the sample mean below.

(a) $\sqrt{\dfrac{1 \cdot x_1 + 2 \cdot x_2 + 3 \cdot x_3 + 4 \cdot x_4}{4}}$

(b) $\sqrt{\dfrac{(x_1 - -\bar{x})^2 + (x_2 - -\bar{x})^2 + (x_3 - -\bar{x})^2 + (x_4 - -\bar{x})^2}{3}}$

(c) $\sqrt{\dfrac{x_1 + x_2 + x_3 + x_4}{3}}$

(d) $\sqrt{\dfrac{x_1 + x_2 + x_3 + x_4}{4}}$

(e) $\sqrt{\dfrac{(x_1 - \bar{x})^2 + (x_2 - -\bar{x})^2 + (x_3 - -\bar{x})^2 + (x_4 - -\bar{x})^2}{4}}$

5.(5pts) A baseball player has a 0.250 batting average ($= \dfrac{\# \text{ hits}}{\# \text{ times at bat}}$). In the course of last season he came to bat 300 times. What is H, his expected number of hits for the season and what is the standard deviation D, for this player hits?

(a) $(H, D) = (75, 4.33)$ (b) $(H, D) = (225, 7.50)$ (c) $(H, D) = (75, 7.50)$

(d) $(H, D) = (100, 8.66)$ (e) $(H, D) = (7.5, 2.70)$

6.(5pts) If Z is a standard normal random variable, what is $P(-0.5 \leq Z \leq 1.5)$.

Note You will find tables for the standard normal distribution at the end of the exam.

(a) 0.8413   (b) 0.3085   (c) 0.9332

(d) 0.2417   (e) 0.6247

5. Initials: _____

7.(5pts) The height (at the shoulder) of adult snopalopagus' is normally distributed with mean $\mu = 10$ ft. and standard deviation $\sigma = 3$ ft. If I choose an adult snopalopagus at random from the population, what is the probability that it will have a shoulder height greater than 15.4 feet?

(a) 0.1358   (b) 0.0001   (c) 0.9641

(d) 0.0359   (e) 0.4591

8.(5pts) What is the maximum of the objective function (rounded off to two decimal places) $2x + 4y$ on the feasible set shown as the shaded region in the diagram below?
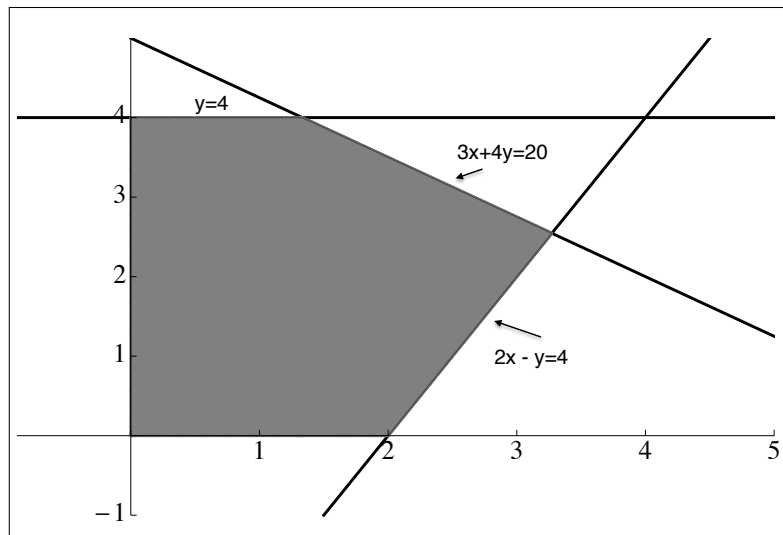
(a) 16.73   (b) 13.33   (c) 18.67   (d) 22.48   (e) 18.18

9.(5pts) Below we give three inequalities A, B and C:

$$
\begin{array}{llrcr}
A: & 2x & + \ 3y & \geq & 12 \\
B: & 2x & - \ \ y & \leq & 2 \\
C: & & y & > & 2
\end{array}
$$

Which of the pictures below shows the correct graphs of A, B and C?

(a)

(b)

(c)

(d)
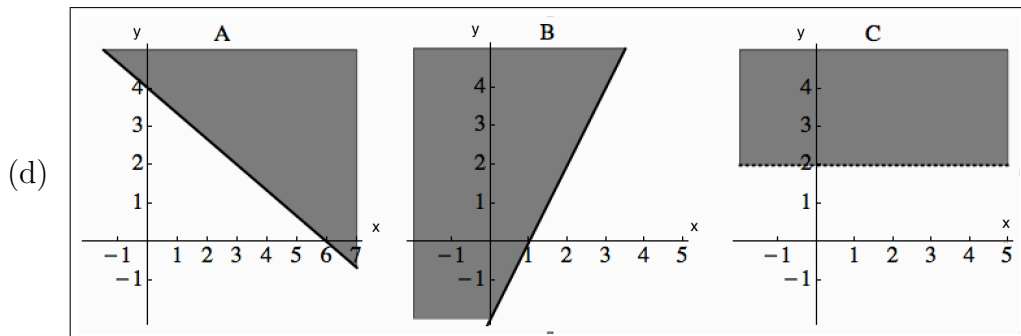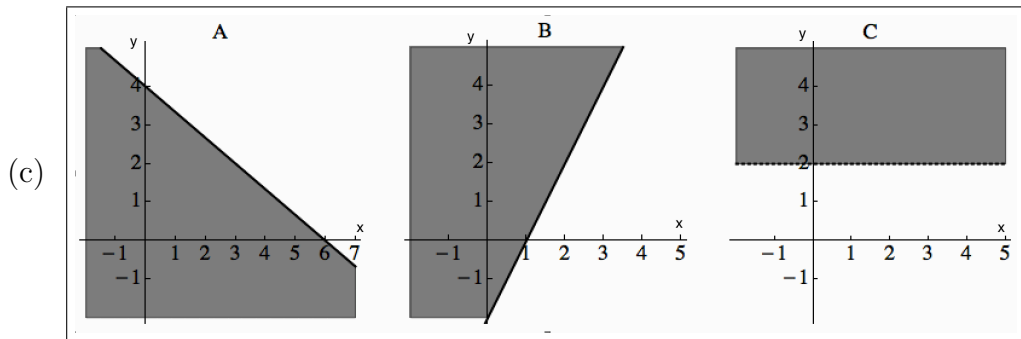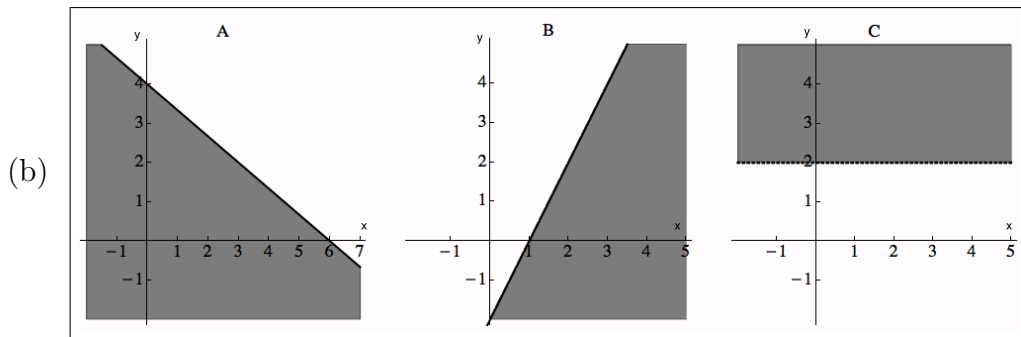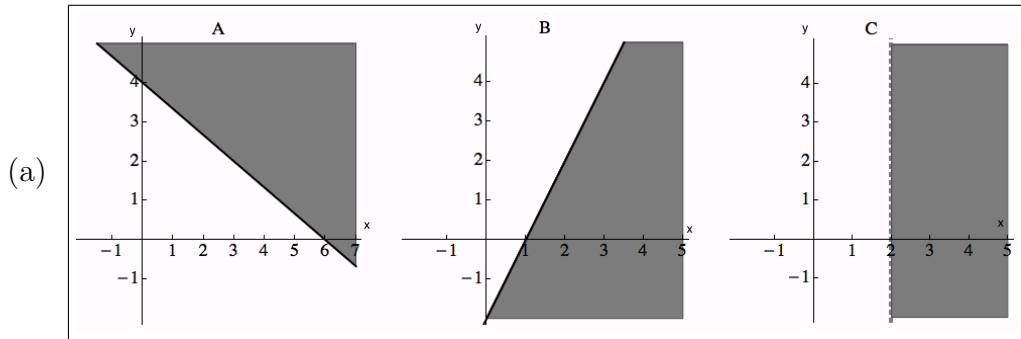
(e) None of the above

10.(5pts) Joe and Mary run a small business producing tables and chairs. Joe produces the parts for the furniture and Mary assembles the furniture. It takes Joe 10 hours to produce the parts for a table and it takes him 4 hours to produce the parts for one chair. It takes Mary one hour to assemble a table and two hours to assemble a chair. Joe has 40 hours to devote to making furniture parts each week and Mary has 8 hours to devote to assembling furniture each week. Each table sold brings a profit of $200 and each chair sold brings a profit of $50. Mary and Joe sell all of the furniture that they produce and wish to maximize profits. Let x denote the number of tables that Mary and Joe make in a week and let y denote the number of chairs they make in a week, which of the following give the constraints on x and y and the objective function?

(a)
$$
\begin{aligned}
10x + 4y &\leq 40 \\
x + 2y &\leq 8 \\
y &\geq 0 \\
x &\geq 0
\end{aligned}
$$
Obj. Function: $200x + 50y$

(b)
$$
\begin{aligned}
10x + y &\leq 40 \\
4x + 2y &\leq 8 \\
y &\geq 0 \\
x &\geq 0
\end{aligned}
$$
Obj. Function: $200x + 50y$

(c)
$$
\begin{aligned}
10x + 2y &\leq 8 \\
x + 4y &\leq 40 \\
y &\geq 0 \\
x &\geq 0
\end{aligned}
$$
Obj. Function: $200x + 50y$

(d)
$$
\begin{aligned}
4x + 10y &\leq 40 \\
2x + y &\leq 8 \\
y &\geq 0 \\
x &\geq 0
\end{aligned}
$$
Obj. Function: $50x + 200y$

(e)
$$
\begin{aligned}
x + 4y &\leq 40 \\
10x + 2y &\leq 8 \\
y &\geq 0 \\
x &\geq 0
\end{aligned}
$$
Obj. Function: $50x + 200y$

8.

Partial Credit
You must show your work on the partial credit problems to receive credit!

11. (12pts) Joe took admissions tests for two different apprenticeship programs. On the first, where the mean was 74 and the standard deviation 8, he scored 88. On the second, with mean 59 and standard deviation 12, he scored 79.

(a) Compute Joe's z-score on the first test.

(b) Compute Joe's z-score on the second test.

(c) On which test did Joe do better?

9.

12.(12pts) Compute μ, $\sigma^2(X)$, and $\sigma(X)$ for the random variable defined as follows.

x_i	100	160	230
p_i	0.3	0.5	0.2

$\mu =$ _____, $\qquad$ $\sigma^2(X) =$ _____, $\qquad$ $\sigma(X) =$ _____.

10.

13.(12pts) (a)   Graph the feasible set corresponding to the following set of inequalities on the set of axes provided. (Make sure you shade the region corresponding to the feasible set and clearly identify the region as the feasible set.)

$$
\begin{aligned}
2y + x &\le 8 \\
y + 3x &\ge 9 \\
x &\ge 0 \\
y &\ge 0 \\
x &\le 6
\end{aligned}
$$
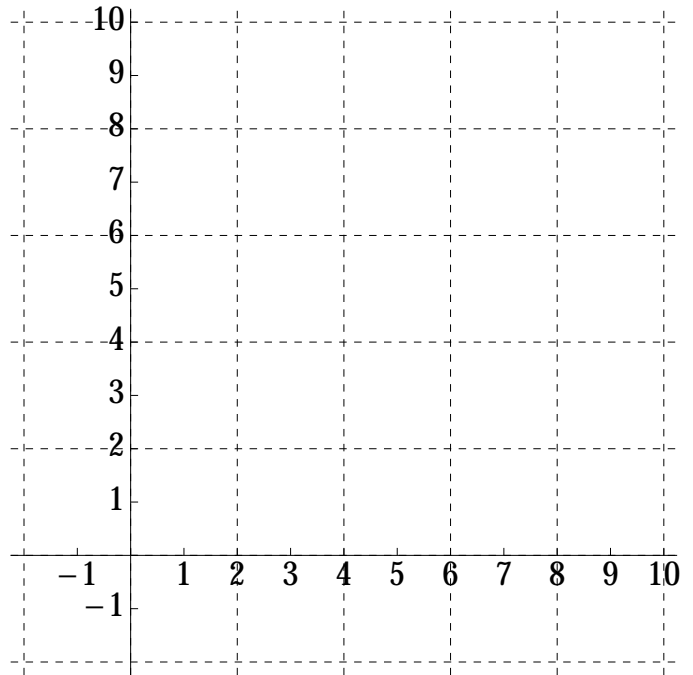
(b) Find the vertices of the above feasible set.

(c) Find the **minimum** value of the objective function $5x + 4y$ on the above feasible set.

14.(12pts) The Lifetime of the Northern Basselope is normally distributed with mean 80 years and standard deviation 4 years. Let X denote the lifetime of a Northern Basselope chosen at random from the population.

(i)   The graphs below represent areas under the standard normal distribution, with mean zero and standard deviation 1. Which of the shaded areas shown below equals $P(X \leq 72)$, where X is the random variable described in Part (a).

(a)

(b)

(c)

(d)
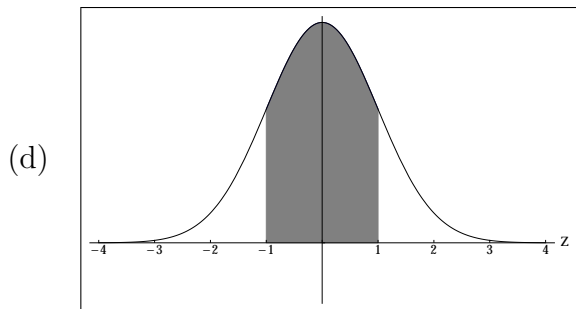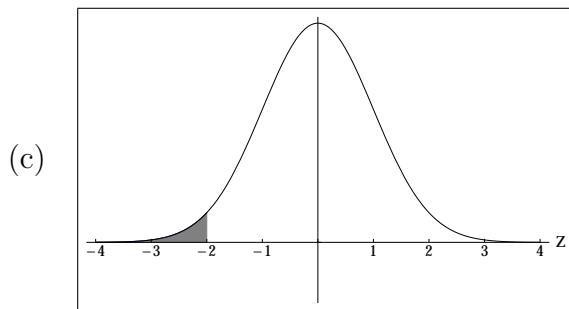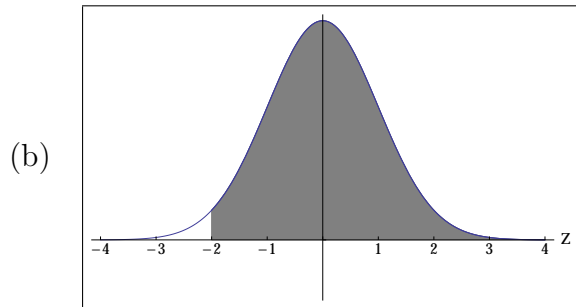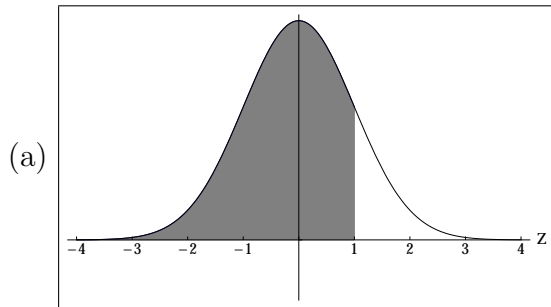
(ii)   Calculate $P(X \leq 72)$, where X is the random variable described in Part (a).
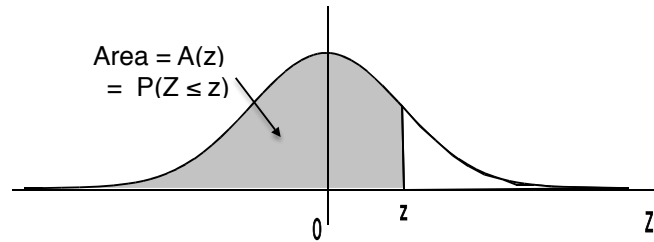
(iii)   In a random sample of 100 Northern Basselopes, how many would you expect to live to an age **greater than** 72 years?

12.   Initials: _____

15.(2pts) You will get this 2 points if your instructor can read your name easily on the front page of the exam and you mark the answer boxes with an X (as opposed to a circle or any other mark).

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Areas under the Standard Normal Curve

Area = A(z)
= P(Z ≤ z)

z	$A(z)$	z	$A(z)$	z	$A(z)$	z	$A(z)$	z	$A(z)$
−3.50	.0002	−2.00	.0228	−.50	.3085	1.00	.8413	2.50	.9938
−3.45	.0003	−1.95	.0256	−.45	.3264	1.05	.8531	2.55	.9946
−3.40	.0003	−1.90	.0287	−.40	.3446	1.10	.8643	2.60	.9953
−3.35	.0004	−1.85	.0322	−.35	.3632	1.15	.8749	2.65	.9960
−3.30	.0005	−1.80	.0359	−.30	.3821	1.20	.8849	2.70	.9965
−3.25	.0006	−1.75	.0401	−.25	.4013	1.25	.8944	2.75	.9970
−3.20	.0007	−1.70	.0446	−.20	.4207	1.30	.9032	2.80	.9974
−3.15	.0008	−1.65	.0495	−.15	.4404	1.35	.9115	2.85	.9978
−3.10	.0010	−1.60	.0548	−.10	.4602	1.40	.9192	2.90	.9981
−3.05	.0011	−1.55	.0606	−.05	.4801	1.45	.9265	2.95	.9984
−3.00	.0013	−1.50	.0668	.00	.5000	1.50	.9332	3.00	.9987
−2.95	.0016	−1.45	.0735	.05	.5199	1.55	.9394	3.05	.9989
−2.90	.0019	−1.40	.0808	.10	.5398	1.60	.9452	3.10	.9990
−2.85	.0022	−1.35	.0885	.15	.5596	1.65	.9505	3.15	.9992
−2.80	.0026	−1.30	.0968	.20	.5793	1.70	.9554	3.20	.9993
−2.75	.0030	−1.25	.1056	.25	.5987	1.75	.9599	3.25	.9994
−2.70	.0035	−1.20	.1151	.30	.6179	1.80	.9641	3.30	.9995
−2.65	.0040	−1.15	.1251	.35	.6368	1.85	.9678	3.35	.9996
−2.60	.0047	−1.10	.1357	.40	.6554	1.90	.9713	3.40	.9997
−2.55	.0054	−1.05	.1469	.45	.6736	1.95	.9744	3.45	.9997
−2.50	.0062	−1.00	.1587	.50	.6915	2.00	.9772	3.50	.9998
−2.45	.0071	−.95	.1711	.55	.7088	2.05	.9798		
−2.40	.0082	−.90	.1841	.60	.7257	2.10	.9821		
−2.35	.0094	−.85	.1977	.65	.7422	2.15	.9842		
−2.30	.0107	−.80	.2119	.70	.7580	2.20	.9861		
−2.25	.0122	−.75	.2266	.75	.7734	2.25	.9878		
−2.20	.0139	−.70	.2420	.80	.7881	2.30	.9893		
−2.15	.0158	−.65	.2578	.85	.8023	2.35	.9906		
−2.10	.0179	−.60	.2743	.90	.8159	2.40	.9918		
−2.05	.0202	−.55	.2912	.95	.8289	2.45	.9929		