This exam is closed book. No graphing calculators are allowed. No bathroom breaks are permitted while taking the exam. Be sure to read through the entire exam for hints and formulas. Good luck!

1 Multiple Choice (2 points each)

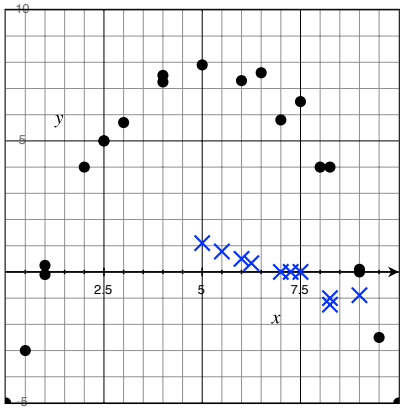
(1) How many years does it take savings of \$2,500, invested at an interest rate of 6.7% and compounded monthly, to appreciate to \$3,004.25? (HINT: Compound interest formula, $A = P(1 + \frac{r}{m})^{mt}$)

(A) 2.75 (B) 0.085 (C) 0.98 (D) 33

(2) The slope of a linear function can be interpreted as the...

(A) Total effect (B) Marginal effect (C) Vertical intercept (D) Starting point

(3) Select the function, in vertex form, that best describes the circular data points in the graph below. (i.e. $y = a(x-h)^2 + k$, where $h = \frac{-b}{2a}$ and $k = c - \frac{b^2}{4a}$).



(A) $y = -10(x-5)^2 + 8$

(B) $y = (x+5)^2 + 8$

(C) $y = -\frac{1}{2}(x-5)^2 + 8$

(D) $y = -(x+2)^2 + 4$

(4) Solve the inequality for x: $-13 < -3x + 2 \leqslant -7$

(A) [-5, -3) (B) (-5, -3] (C) [3, 5] (D) [3, 5)

(5) Solve for x: $\log_3 x = \frac{3}{2}$

(A) $x = 0.41$ (B) $x = 0.18$ (C) $x = 5.2$ (D) $x = 1.1$

(6) The graph in question (3) contains some sample data points ($\times$'s). Choose the best linear regression model estimate for this sample data.

(A) $y = -2.1x + 8.3$
(B) $y = -0.54x + 3.6$
(C) $y = 0.23x - 1.2$
(D) $y = 1.51x + 4.2$

(7) Use the properties of logarithms to solve for x: $\ln(2x-1) = \ln x + \ln(x-2)$
(HINT: Recall quadratic formula, $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$.)

(A) $x = \frac{3\pm\sqrt{5}}{2}$ (B) $x = \frac{2\pm\sqrt{3}}{2}$ (C) $x = \frac{19}{3}$ (D) $x = 2 \pm \sqrt{3}$

(8) A country has a population growth rate of 1.8% compounded continuously (i.e. $A = Pe^{rt}$). Exactly how many years will it take for the population to double?

(A) 28.9 (B) 0.38 (C) 38.5 (D) 39

(9) Fill in the blanks: A vertical line has a slope of _____ and a 45 degree line has a slope of _____.

(A) undefined, 1 (B) 0, undefined (C) ∞, $\frac{1}{2}$ (D) undefined,∞

(10) Solve the linear system using any method:

$$2x - 2y = 4$$
$$5x - 10y = -3$$

(A) 0 solutions (B) ∞ solutions (C) 1 solution (D) None of the above.

2 Short Answer **(3 points each)**

You must show all work for full credit.

(11) Consider a retail chain selling cell phones. The retail price $p(x)$ (in dollars) and the weekly demand x for a particular phone are related by the function $p(x) = 625 - 5\sqrt{x}$, where $50 \leqslant x \leqslant 500$.

(i) *Describe* how the graph of the function $p(x)$ can be obtained from the graph of one of the six elementary functions (i.e. list the transformations).

(ii) *Graph* the function, $p(x)$.

(12) How does one find the inverse of some function, $y = f(x)$? What constraint must the function meet?

(13) Consider two firms and their linear supply functions. Firm one supplies 2 widgets at a price of \$6 each and 5 when priced at \$11. Firm two supplies 4 widgets at a price of \$7 each and 6 when priced at \$8. We are interested in the price at which both firms will supply the same quantity.

(i) *Write down* the two supply equations as a linear system. (HINT: The supply equations must be in standard form, $ax + by = c$)

(ii) *Rewrite* the linear system into an augmented matrix.

(iii) *Solve* the system using any method (i.e. find the price when quantity supplied is the same for both firms).

(14) An initial investment of \$5,300 is invested for 2.5 years in an account that earns 1.2% interest continuously compounded. The balance is then transferred to a certificate of deposit that pays 2% interest, compounded quarterly, for a period of 1 year. What is the final value of the investment?