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 useful formulas. Remember to check answers that can be checked. Good luck!

1 Multiple Choice (2 points each)

(1) Simplify with positive exponents: $\frac{4m^{-7}n^2}{m^{-9}n^{-3}}$

(A) Cannot be simplified further
(B) $4m^2n^5$
(C) $\frac{4n^5}{m^2}$
(D) $\frac{4m^{16}}{n^5}$

(2) Rationalize and simplify the expression:

$$\frac{\sqrt{5m+n}+\sqrt{5m}}{n}$$

(A) $\frac{10m+n+2\sqrt{(5m+n)5m}}{n^2}$
(B) $\frac{n}{\sqrt{5m+n}-\sqrt{5m}}$
(C) $\frac{1}{\sqrt{5m+n}-\sqrt{5m}}$
(D) Cannot rationalize expression

(3) Is $5x^2 - 32x - 140$ factorable into integer coefficients?

(A) Yes
(B) No

(4) If yes to number (3), factor it.

(A) $(5x+7)(x-20)$
(B) $(x+7)(5x+20)$
(C) $(5x+10)(x-14)$
(D) Cannot factor

(5) Find the sum of all even integers between 16 and 1,089.

(A) 591,744
(B) 295,872
(C) 592,848
(D) 296,424

(6) Find the infinite sum of the following geometric series if possible: $\frac{1}{32}, \frac{1}{16}, \frac{1}{8}, \ldots$

(A) Cannot sum
(B) 6.75
(C) 0.625
(D) 62.5

(7) Find $g(1) + g(2) + \cdots + g(10)$ if $g(x) = 2^x$. (HINT: $S_n = \frac{ra_n - a_1}{r-1}$).

(A) 2,046 (B) 1,023 (C) $2,048$ (D) $1,024$

(8) Due to tax breaks, individuals have an extra \$3,500 of disposable income. Assume consumers spend 75% of this income. Because one person's spending is another's income, this initial spending "stimulates" the economy, all else equal. What is the total additional spending in the economy? (HINT: $S_\infty = \frac{a_1}{1-r}$).

(A) \$14,000 (C) Cannot sum
(B) \$10,500 (D) \$4,667

(9) The formula $\frac{1}{n}\sum_{j=1}^{n} u_j$ defines what?

(A) Sum (C) Arithmetic mean
(B) Geometric mean (D) Sequence

(10) Factor completely: $2a + ab + 6 + 3b$

(A) Cannot factor further (C) $(a + 3)(b + 2)$
(B) $2(a + 3) + b(a + 3)$ (D) $a(2 + b) + 6 + 3b$

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

NOTE: You must show all work to receive full credit!

(11) Expand $(2m + 3n)^3$ completely so that no parentheses remain.

(12) Recall the quadratic formula, $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$. Describe the number of real solutions to $ax^2 + bx + c = 0$ when the *discriminant* is positive, zero, and negative, respectively.

(13) Show that the sum of the first n odd positive integers is n^2. (HINT: $a_n = a_1 + (n - 1)d$ and $S_n = \frac{n}{2}(a_1 + a_n)$).

(14) Frank "the Tank" Kaminsky basketballs are a hot commodity on the black market during March madness. Weekly supply and demand equations are estimated as the following:

$$\text{Supply: } p = \frac{x}{4} + 6$$

$$\text{Demand: } p = \frac{1,240}{x}$$

(i) What is the equilibrium number of basketballs, x^*, when supply equals demand?

(ii) At what equilibrium price, p^*?