This exam is closed book. No graphing calculators or cell phones are allowed. No bathroom breaks are permitted while taking the exam. Good luck!

1   Multiple Choice (2 points each)

(1)   Simplify the following expression with only positive exponents: $\frac{15m^{-9}n^7}{3m^{-3}n^{-3}}$

(A) Cannot be simplified further

(B) $\frac{15}{3}m^{-6}n^{10}$

(C) $5\frac{n^{10}}{m^6}$ (D) $5\frac{m^6}{n^4}$

(2)   Rationalize the numerator and simplify: $\frac{\sqrt{2(a+h)}-\sqrt{2a}}{h}$

(A) $\frac{2}{\sqrt{2(a+h)}+\sqrt{2a}}$

(B) $\frac{2a+2h}{\sqrt{2(a+h)}-\sqrt{2a}}$

(C) $\frac{2(a+h)-2\sqrt{2(a+h)}\sqrt{2a}+2a}{h(\sqrt{2(a+h)}\sqrt{2a})}$

(D) Cannot rationalize

(3)   Is $4x^2 - 10x + 4 = 0$ factorable?

(A) Yes

(B) No

(4)   If yes to number (3), factor it and find its solutions.

(A) Cannot factor

(B) $x = 8, 2$

(C) $x = -2, -\frac{1}{2}$

(D) $x = 2, \frac{1}{2}$

(5)   Find the sum of all even integers between 23 and 97.

(A) 2,124

(B) 2,352

(C) 2,200

(D) 2,220

(6)   Find the sum of the following infinite geometric series: $1, -\frac{3}{2}, \frac{9}{4}, -\frac{27}{8}, \ldots$
(Recall that $S_\infty = \frac{a_1}{1-r}$)

(A) Cannot sum

(B) $\frac{6}{10}$

(C) $\frac{4}{10}$

(D) $-\frac{13}{8}$

(7)   Multiply and express using positive exponents only: $(3u^{\frac{1}{2}} - v^{\frac{1}{2}})(u^{\frac{1}{2}} - 4v^{\frac{1}{2}})$

(A) $3u - 11u^{\frac{1}{2}}v^{\frac{1}{2}} + 4v$

(B) $3u - 13u^{\frac{1}{2}}v^{\frac{1}{2}} + 4v$

(C) $u - 12u^{\frac{1}{2}}v^{\frac{1}{2}} - 4v$

(D) $3u^{\frac{1}{2}} - 13uv + 2v^{\frac{1}{2}}$

(8)   Find the sum of the finite arithmetic series, S_{23}, if $a_1 = 8, d = -10$.
(Recall that $S_n = \frac{n}{2}(a_1 + a_n)$)

(A) -2,461

(B) -2,346

(C) -4,692

(D) 2,346

(9)   Fill in the blank: the formula $\bar{a} = \frac{1}{n} \sum_{k=1}^{n} a_k$ represents the _____ in summation notation.

(A) geometric mean   (C) sequence
(B) arithmetic sum   (D) arithmetic mean

(10)   In response to the Global Financial Crisis, congress passed the Economic Stimulus Act of 2008. Among its many provisions, approximately \$300 was distributed to each qualifying taxpayer. If each taxpayer spent \$285 of this rebate, what was the total economic impact of the initial spending, per taxpayer?
(Hint: this is a fiscal multiplier question.)

(A) \$6,000   (C) \$5,400
(B) \$5,700   (D) \$5,000

2   Short Answer (3 points each)

(11)   Multiply $(m + 2n)^3$, or expand 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)   If P dollars are invested at r percent (a decimal) compounded annually, at the end of 2 years it will grow to $A = P(1 + r)^2$. At what interest rate r will \$1,000 grow to \$1,210 in 2 years?

(14)   An importer sells tablet computers in Chinatown. Her weekly supply and demand equations are

$$p = \frac{x}{6} + 9 \qquad \text{Supply}$$
$$p = \frac{24,840}{x} \qquad \text{Demand}$$

where x is the number of units bought/sold. What is the equilibrium number of tablets bought/sold? At what price will supply equal demand?