Place the letter of the correct answer in the space provided as well as on the answer sheet. Make sure you attempt the Tie-Breaker questions at the end of the test if you have time.

_____1. Perform the indicated operations and simplify: $5x - 2x[7 - (x - 3)]$

A) $30x - 3x^2$ 　　　　　　 B) $-15x + 2x^2$ 　　　　　　 C) $12x - 3x^2$ 　　　　　　 D) $-3x + 2x^2$

_____2. Factor completely, relative to the integers: $3x^2 + x - 14$

A) $(3x + 7)(x - 2)$ 　　　 B) $(3x - 7)(x + 2)$ 　　　 C) $(3x - 2)(x + 7)$ 　　　 D) $(3x + 2)(x - 7)$

_____3. Perform the indicated operations and simplify: $\dfrac{9 - \dfrac{x^2}{y^2}}{3 + \dfrac{x}{y}}$

A) $\dfrac{3y - x}{y}$ 　　　　 B) $3 - x$ 　　　　 C) $\dfrac{9y^2 - x^2}{3y + x}$ 　　　　 D) $\dfrac{(9y - x)(9y + x)}{y(3y + x)}$

_____4. Perform the indicated operations and simplify: $\dfrac{4x + 8}{9x^3} \div \dfrac{x^2 - 4}{3x}$

A) $\dfrac{4(x + 2)^2 (x - 2)}{27x^4}$ 　　 B) $\dfrac{4}{3x^2 (x - 2)}$ 　　 C) $\dfrac{4x}{x - 2}$ 　　 D) $\dfrac{4}{x^2 (x - 2)}$

_____5. Simplify and write your answer using positive exponents only: $\left(\dfrac{4x^{-1}y^8}{12x^2 y^6} \right)^{-2}$

A) $\dfrac{9x^2}{y^4}$ 　　　　 B) $\dfrac{9x^9}{y^4}$ 　　　　 C) $\dfrac{y^4}{9x^6}$ 　　　　 D) $\dfrac{9x^6}{y^4}$

_____6. Simplify: $\left(7x^{\frac{1}{2}} \right)\left(5x^{\frac{3}{4}} \right)$

A) $35x^{\frac{3}{8}}$ 　　　　 B) $35x^{\frac{4}{6}}$ 　　　　 C) $35x^{\frac{5}{4}}$ 　　　　 D) $12x^{\frac{2}{3}}$

_____7. Solve the equation for x: $\dfrac{3}{x + 5} + \dfrac{2}{x - 4} = \dfrac{13}{(x + 5)(x - 4)}$

A) $x = -5, x = 4$ 　　　 B) $x = 3$ 　　　 C) $x = \dfrac{5}{6}$ 　　　 D) $x = \dfrac{12}{5}$

_____8. Solve the inequality and write the final answer using interval notation: $|4x+8| \geq 12$

A) $(-\infty,-5] \cup [1,\infty)$ B) $(-5,1)$ C) $(-\infty,-5) \cup (1,\infty)$ D) $[-5,1]$

_____9. Solve the inequality and write the final answer using interval notation: $-7 < -3x+5 < 11$

A) (4, -2)   B) (-4, 2)   C) (-2, 4)   D) $\left(\dfrac{-16}{3}, \dfrac{2}{3}\right)$

_____10. Perform the indicated operations and reduce to lowest terms: $\dfrac{4+i}{3-2i}$

A) $\dfrac{12+11i+2i^2}{9-4i^2}$ B) $\dfrac{10+11i}{13}$ C) $\dfrac{14-5i}{5+2i}$ D) 4

_____11. Solve the radical equation for x and check your answer: $\sqrt{x+14} = x+2$

A) {-2, 5}   B) {-5}   C) {2}   D) {-5, 2}

_____12. Solve for x using the quadratic formula: $x^2 + 5x - 2 = 0$

A) $x = \dfrac{-5 \pm \sqrt{33}}{2}$ B) $x = \dfrac{-5 \pm \sqrt{17}}{2}$ C) $x = -5 \pm \dfrac{\sqrt{33}}{2}$ D) $x = -5 \pm \dfrac{\sqrt{17}}{2}$

_____13. Find the domain of the function and write your answer in interval notation: $f(x) = \sqrt{3x-15}$

A) (-∞, 5]   B) [5, ∞)   C) (5, ∞)   D) (-∞, 5) ∪ (5, ∞)

_____14. If $f(x) = 3x+4$ and $g(x) = x^2 - 5$, find $(g \circ f)(x)$ and simplify.

A) $3x^3 + 4x^2 - 15x - 20$ B) $9x^2 + 11$ C) $9x^2 + 24x + 11$ D) $3x^2 - 11$

_____15. Determine the <u>vertex</u> of the parabola given by: $f(x) = 3(x+2)^2 - 9$

A) (2, 9)   B) (-2, -9)   C) (2, -9)   D) (-2, 9)

_____16. Given that x = 2 is a root of $P(x) = x^3 - 3x^2 - 18x + 40$, find the remaining roots.

A) x = -5, x = 4   B) x = -8, x = 5   C) x = -5, x = 8   D) x = -4, x = 5

_____17. Write in terms of simplest logarithmic form: $\log_b\left(\dfrac{x^4 y^2}{z^5}\right)$

A) $\dfrac{(4\log_b x)(2\log_b y)}{(5\log_b z)}$

B) $4\log_b x + 2\log_b y - 5\log_b z$

C) $\log_b x^4 + \log_b y^2 - \log_b z^5$

D) $\log_b(x^4 + y^2 - z^5)$

_____18. Solve for x: $6^{5x+2} = 36^{3x-4}$

A) x = -1   B) x = 10   C) x = 6   D) x = 2

_____19. Solve for x exactly: $\log_3 x + \log_3(x-8) = 2$

A) x = -1, x = 9   B) x = 9   C) x = -1   D) x = 1, x = 3

_____20. Solve for x exactly: $\log x - \log 3 = \log 4 - \log(x+4)$

A) x = -2, x = 6   B) x = -6, x = 2   C) x = 2   D) x = 6

An urn contains 100 marbles. Fifty are purple, ten are green, fifteen are red, twenty-five are orange. Two marbles are drawn at random one after another without replacement. Calculate the following:

_____21. P(green and green)

A) $\dfrac{100}{10000}$ B) $\dfrac{90}{10000}$ C) $\dfrac{90}{100}$ D) $\dfrac{90}{9900}$

_____22. Suppose you drive a distance of 147 miles at a speed of 35 miles per hour. How many hours does it take?

A) 3.5 hours   B) 4.2 hours   C) 2.7 hours   D) 0.238 hour

_____23. Find the center and radius of the circle given by the equation: $x^2 + y^2 + 2x + 4y = 11$

A) $(-2,-1), r = 4$ B) $(2,1), r = 4$ C) $(1,2), r = 4$ D) $(-1,-2), r = 4$

_____24. Find the domain for $f(x) = \dfrac{3}{x-6}$

A) $(-\infty,-6] \cup [-6,\infty)$ B) $(-\infty,6) \cup (6,\infty)$ C) $(-\infty,-6) \cup (-6,\infty)$ D) $(-\infty,6] \cup [-6,\infty)$

_____25. A box with an open top is to be constructed from a square piece of cardboard, 3 ft wide, by cutting out a square of length x from each of the four corners and bending up the sides. Find the formula for the volume of the box in cubic inches.

A) $V = x^3$ B) $V = 36^3$ C) $V = x(36-2x)^2$ D) $V = x^2(36-2x)$

Tie Breaker #1

Jennifer ran 6 miles in 43.7 minutes. Find her speed in feet per second.

Tie Breaker #2

In how many ways can 11 players be selected to from 25 to form a football team if each of the eleven players can play any position? You may leave your answer as a combination or permutation, whichever is more appropriate.

Tie Breaker #3

The half-life of cesium-137 is 30 years. Suppose we have a 200 mg sample. (a) Find the mass that remains after t years. (b) How much of the sample remains after 100 years? (c) After how long will only 1 mg remain?

Answers

1.   B
2.   A
3.   A
4.   B
5.   D
6.   C
7.   B
8.   A
9.   C
10.   B
11.   C
12.   A
13.   B
14.   C
15.   B
16.   D
17.   B
18.   B
19.   B
20.   C
21.   D
22.   B
23.   D
24.   B
25.   C

Tie Breaker #1
12.08 ft/sec

Tie Breaker #2
$_{25}C_{11}$ or 4457400

Tie Breaker #3
a) $.5 = e^{30t}$
b) 19.8 mg
c. approximately 229 years ($228 < t < 231$)