

**TMTA
ALGEBRA I
2008**

Prepared by:

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1) Perform the indicated operations and simplify: $\frac{2x + y}{y^2} \cdot \frac{3y^2 - 3xy}{y^2 + 2xy}$

A) $\frac{2xy}{y + 2x}$

B) $\frac{y + 2x}{2y^2}$

C) $\frac{3(y - x)}{y^2}$

D) $\frac{3(x - y)}{y}$

E) $\frac{6y}{y - x}$

2) Determine the remainder in the given division: $\frac{8x^3 + 4x^2 - 2}{2x - 3}$

A) 34

B) -38

C) 25

D) -29

E) 22

3) Perform the indicated operations and simplify, assuming $x \neq 0$:

$$(-5x^{-4})(-3x^3)^2$$

A) $\frac{225}{x^2}$

B) $15x^2$

C) $-45x^2$

D) $15x^5$

E) $-45x$

4) Which property of real numbers is illustrated by the following?

$$3[-2 + (2 + 0)] = 3[(-2 + 2) + 0]$$

A) Additive inverse property

B) Additive identity property

C) Commutative property of addition

D) Associative property of addition

E) Distributive property of multiplication over addition

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5) Simplify: $\frac{9^{4x}}{3^{x-1}}$

- A) 3^{3x-1} B) 3^{3x+1} C) 3^{5x-1}
D) 3^{7x-1} E) 3^{7x+1}
-

6) Simplify: $-3^2 - 6(2 \div 4 + x)$

- A) $-6x - 3$ B) $-6x - 12$ C) $-6x + 11$
D) $-6x + 6$ E) $-6x - 21$
-

7) Which line is perpendicular to $5x - y = 6$ and passes through the point of intersection of $3x + 7y = 5$ and $x - 2y = 6$?

- A) $y = \frac{1}{5}x + \frac{1}{5}$ B) $y = 5x - 21$ C) $y = -\frac{1}{5}x - \frac{1}{5}$
D) $y = \frac{1}{5}x - 3$ E) $y = -\frac{1}{5}x - 1$
-

8) One solution of the equation $2x^3 + 13x^2 + 17x - 12 = 0$ is -3 . Find the sum of the other two solutions.

- A) $-\frac{7}{2}$ B) -4 C) $\frac{9}{2}$
D) -11 E) $-\frac{5}{2}$
-

9) A triangle has side lengths 6 inches, 10 inches, and $2\sqrt{14}$ inches. What is the length of the altitude to the longest side?

- A) $4\sqrt{5}$ inches B) $2\sqrt{5}$ inches C) $\sqrt{3}$ inches
D) $2\sqrt{3}$ inches E) 4 inches

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10) Given $f(x) = 2x^2 - 3x + 1$ and $g(x) = 3x + 2$, find $g[f(x)]$.

A) $6x^3 - 5x^2 - 3x + 2$

B) $2x^2 + 3$

C) $18x^2 - 9x + 3$

D) $6x^2 - 9x + 5$

E) $18x^2 + 15x + 3$

11) The sum of the squares of two consecutive odd integers is 290. Which equation describes this situation?

A) $(x + 2)^2 = 290$

B) $x^2 + (x + 1)^2 = 290$

C) $[x + (x + 1)]^2 = 290$

D) $x^2 + (x + 2)^2 = 290$

E) $[x + (x + 2)]^2 = 290$

12) The remainder when $x^3 + 2x^2 + k$ is divided by $x + 3$ is -7 . Find k .

A) -16

B) -22

C) -52

D) 2

E) -10

13) Solve for y in $x = \frac{2y}{y + 3}$.

A) $y = \frac{3x}{2 - x}$ for $x \neq 2$

B) $y = \frac{3}{2x}$ for $x \neq 0$

C) $y = \frac{3}{2 - x}$ for $x \neq 2$

D) $y = 3x$

E) $y = \frac{2}{3 - x}$ for $x \neq 3$

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- 14) P is inversely proportional to T and directly proportional to the square of X . If $P = 6$ when $T = 3$ and $X = 4$, find T when $P = 2$ and $X = -1$.

- A) $\frac{9}{16}$ B) $\frac{5}{8}$ C) $-\frac{6}{7}$
D) $-\frac{7}{8}$ E) $-\frac{16}{9}$
-

- 15) Simplify: $(3x - 2)(2x^2 - 5x + 4) - (x^2 + 2x - 1)$

- A) $6x^3 - x^2 - 17x - 7$ B) $6x + 10x^2 + 24x - 9$
C) $6x^3 - 20x^2 + 20x - 7$ D) $6x^3 + 5x^2 + 2x - 7$
E) $6x^3 - 4x^2 - 3x - 9$
-

- 16) Solve and write solution set using interval notation: $8x^2 + 13x + 5 \geq 0$

- A) $(-\infty, -1] \cup \left[-\frac{5}{8}, \infty\right)$ B) $\left[\frac{5}{8}, 1\right]$
C) $\left[-\frac{5}{4}, -\frac{1}{2}\right]$ D) $\left(-\infty, \frac{5}{8}\right] \cup [1, \infty)$
E) $\left[-1, -\frac{5}{8}\right]$
-

- 17) Simplify, assuming $b \neq 0$: $\sqrt[3]{\frac{4a}{3b^2}}$

- A) $\frac{2\sqrt[3]{3a}}{3b}$ B) $\frac{\sqrt[3]{4a}}{3b}$ C) $\frac{\sqrt[3]{36ab}}{3b}$
D) $\frac{2\sqrt[3]{a}}{b}$ E) $\frac{2\sqrt[3]{9a}}{3b}$

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18) Solve for x: $\frac{x + 3}{2} - \frac{x - 2}{4} < 2$

- A) $x > 0$ B) $x > -2$ C) $x < -2$
D) $x < -6$ E) $x < 0$
-

19) A four-wheeler made a trip of 90 miles. If the speed had been increased by 3 mph, the trip time would have been one hour less. How fast was the four-wheeler traveling?

- A) 27 mph B) 24 mph C) 21 mph
D) 18 mph E) 15 mph
-

20) Susie has a collection of 16 coins, all nickels, dimes, and quarters, with a total worth of \$2.20. If the dimes were nickels, the quarters were dimes, and the nickels were quarters, then the total worth of the coins would be \$1.65. How many dimes does Susie have?

- A) 2 B) 3 C) 4
D) 5 E) 8
-

21) Simplify, assuming $a \neq 0$ and $b \neq 0$: $\frac{a^{-2} - b^{-2}}{a^{-1} - b^{-1}}$

- A) $\frac{1}{a - b}$ B) $\frac{a + b}{ab}$ C) $\frac{a - b}{ab}$
D) $\frac{a^2 + ab + b^2}{ab}$ E) $\frac{b - a}{ab}$

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22) The quadratic equation $ax^2 - 2x + c = 0$ has two solutions whose product is -6 and whose sum is $-\frac{5}{2}$. Find c .

- A) $-\frac{5}{3}$ B) $\frac{5}{6}$ C) $\frac{24}{5}$
D) $-\frac{12}{5}$ E) $\frac{10}{3}$
-

23) Find the solution set for the given inequality: $-5(2x - 1) - 3 \geq -4(x + 1)$

- A) $\left[-\frac{1}{3}, \infty\right)$ B) $\left(-\infty, \frac{1}{3}\right]$ C) $(-\infty, 1]$
D) $[1, \infty)$ E) $\left(-\infty, -\frac{2}{3}\right]$
-

24) One factor of $\left(\frac{1}{xy} + \frac{1}{x^2}\right)$ is $\left(\frac{x}{y} - \frac{y}{x}\right)$. Find the other factor.

- A) $\frac{xy}{x + y}$ B) $\frac{xy}{x - y}$ C) $\frac{xy^2}{x^2 - y^2}$
D) $\frac{x^2 - xy}{xy}$ E) $\frac{1}{x^2 - xy}$
-

25) When completing the square to solve the equation $x^2 - 9x = 12$, what number is added to both sides of the equation?

- A) 81 B) 9 C) $\frac{81}{4}$
D) 36 E) $\frac{9}{4}$

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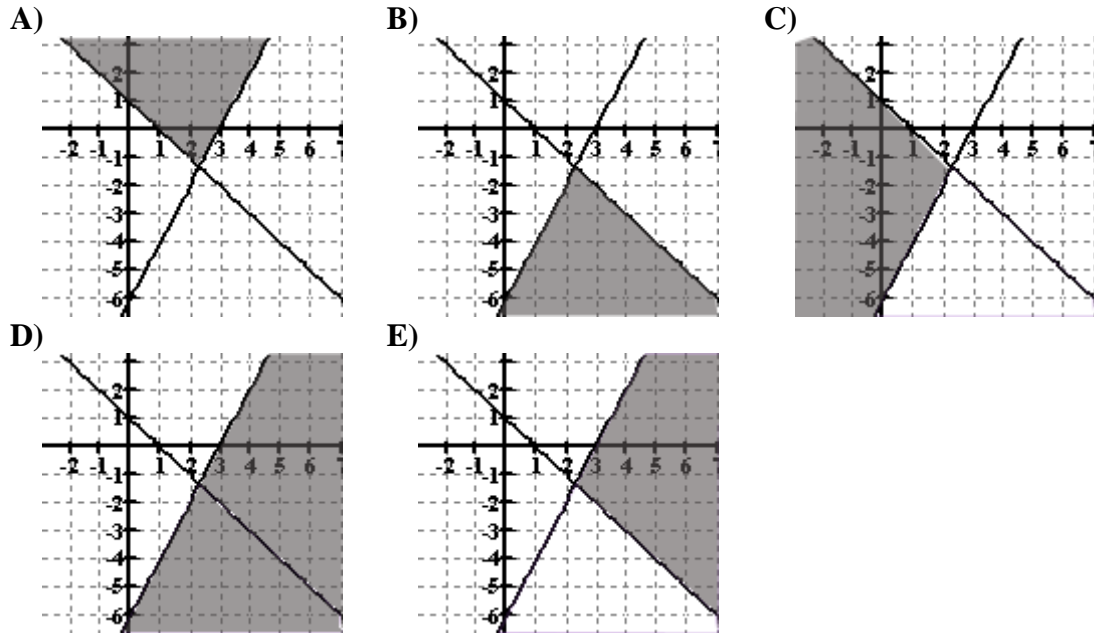
26) Which of the following is a factor of the polynomial $3y^3 + y^2 - 6y - 2$ when factored completely?

- A) $y + 1$ B) $y^2 + 1$ C) $y^2 - 2$
 D) $3y + 2$ E) $3y - 1$
-

27) Which graph shows the solution set of the given system?

$$x + y \geq 1$$

$$2x - y \leq 6$$



28) If $4^x = \sqrt{2}$ and $5^y = \frac{1}{5}$, find $x + y$.

- A) $-\frac{3}{4}$ B) 0 C) $\frac{5}{4}$
 D) $-\frac{1}{2}$ E) $\frac{1}{2}$

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29) Given $g(x) = ax + \frac{b}{x}$, $g(2) = 4$, and $g(-6) = 3$, find b .

- A) $-\frac{7}{12}$ B) $-\frac{5}{2}$ C) $\frac{13}{3}$
D) $\frac{5}{6}$ E) $\frac{45}{4}$
-

30) Simplify: $2\sqrt[4]{162x} - 5\sqrt[4]{32x}$

- A) $-2\sqrt[4]{2x}$ B) -4 C) $-2\sqrt[4]{4x^2}$
D) $82\sqrt[4]{2x}$ E) $-4\sqrt[4]{2x}$
-

31) Solve: $\frac{3}{x+1} + \frac{2}{x} = 3$

- A) $\left\{ \frac{1 \pm i\sqrt{5}}{3} \right\}$ B) $\left\{ \frac{1 \pm \sqrt{7}}{3} \right\}$ C) $\{1 \pm i\sqrt{5}\}$
D) $\left\{ \frac{2 \pm \sqrt{5}}{3} \right\}$ E) $\{1 \pm i\sqrt{7}\}$
-

32) Given that the reciprocal of $(y - 1)$ has the same value as $(y + 2)$, find the sum of all possible values of y .

- A) $\frac{4}{5}$ B) $-\frac{1}{2}$ C) -3
D) $\frac{2}{3}$ E) -1

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33) Find the sum of the y-coordinates of all points of intersection of the parabola $y = 2x^2 - x - 5$ and the line $2x - y = 3$.

- A) $\frac{1}{4}$ B) $\frac{3}{2}$ C) $-\frac{5}{2}$
D) -3 E) -5
-

34) Jan flipped a balanced coin and rolled a balanced die. What is the probability that she got heads on the coin and an even number on the die?

- A) 25% B) $33\frac{1}{3}\%$ C) 40%
D) 50% E) $66\frac{2}{3}\%$
-

35) In an arithmetic sequence the term in the n^{th} position is called a_n . If $a_5 = 27$ and $a_{15} = 72$, find a_{53} .

- A) 114 B) 126 C) 196
D) 243 E) 381
-

36) Find the 8th term in the expansion of $(2x^4 - y^2)^9$.

- A) $18x^4y^{16}$ B) $-18x^4y^{16}$ C) $-144x^8y^{14}$
D) $-72x^8y^{14}$ E) $-576x^8y^{14}$
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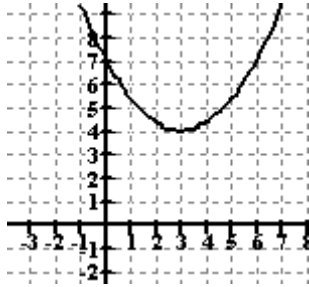
37) Given $i = \sqrt{-1}$ and $x = \sqrt{-4}(\sqrt{-4} - 2i^2)$, find x^2 .

- A) $-4 + 4i$ B) $-32i$ C) 0
D) -32 E) $32 - 32i$

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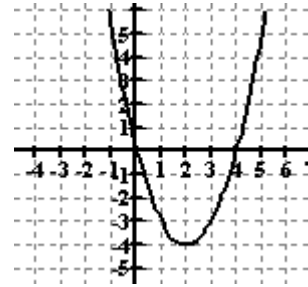
38) Which of the following matches the correct equation with its graph?

A)



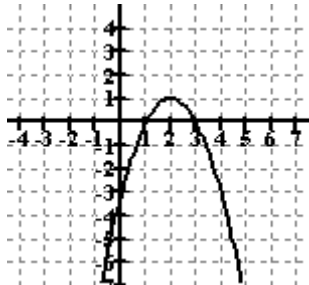
$$y = \frac{1}{3}(x - 3)^2 + 4$$

B)



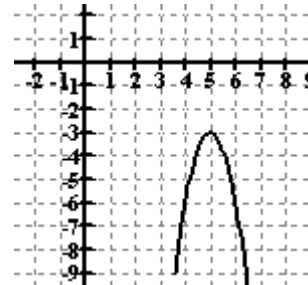
$$y = -(x - 2)^2 - 4$$

C)



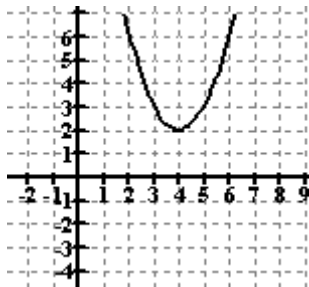
$$y = -(x + 2)^2 + 1$$

D)



$$y = -3(x + 5)^2 - 3$$

E)



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

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39) Perform the indicated operations and simplify, assuming $a \neq b$ and $a \neq 0$:

$$\frac{a^2 + 2ab + b^2}{2a^2 - 2b^2} \div \frac{a^3 + b^3}{2a}$$

A) $\frac{1}{-b(a^2 - ab + b^2)}$

B) $\frac{a}{(a - b)(a^2 - ab + b^2)}$

C) $\frac{a}{(a + b)^2(a - b)}$

D) $\frac{a}{(a - b)^2(a + b)}$

E) $\frac{2a^2b}{(a + b)^2(a - b)}$

40) How much pure alcohol should be added to twelve gallons of fluid that is 45% alcohol to make a solution which is 60% alcohol?

A) $1\frac{4}{5}$ gallons

B) $2\frac{1}{2}$ gallons

C) $3\frac{1}{3}$ gallons

D) $4\frac{1}{2}$ gallons

E) $3\frac{1}{5}$ gallons

EXTRA #1

Given $X(4, -5)$, $Y(-8, 9)$, and $Z(6, -3)$ in the coordinate plane, find the distance from X to the midpoint of the segment joining Y to Z .

- A) $\sqrt{89}$ B) $11\sqrt{2}$ C) $\sqrt{73}$
D) $\sqrt{13}$ E) $2\sqrt{10}$

EXTRA #2

How much pure alcohol should be added to twelve gallons of fluid that is 45% alcohol to make a solution which is 60% alcohol?

- A) $1\frac{4}{5}$ gallons B) $2\frac{1}{2}$ gallons C) $3\frac{1}{3}$ gallons
D) $4\frac{1}{2}$ gallons E) $3\frac{1}{5}$ gallons

EXTRA #3

If $4^{1-2x} = 8^{2x+1}$, find $5x + 2$.

- A) $\frac{3}{2}$ B) 2 C) $\frac{17}{6}$
D) $-\frac{2}{3}$ E) $\frac{3}{4}$

Key Algebra I (2008)

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|-----|---|-----|---|
| 1) | C | 21) | B |
| 2) | A | 22) | C |
| 3) | C | 23) | C |
| 4) | D | 24) | E |
| 5) | E | 25) | C |
| 6) | B | 26) | C |
| 7) | C | 27) | A |
| 8) | A | 28) | A |
| 9) | B | 29) | E |
| 10) | D | 30) | E |
| 11) | D | 31) | B |
| 12) | D | 32) | E |
| 13) | A | 33) | D |
| 14) | A | 34) | A |
| 15) | C | 35) | D |
| 16) | A | 36) | C |
| 17) | C | 37) | B |
| 18) | E | 38) | A |
| 19) | E | 39) | B |
| 20) | E | 40) | D |

EXTRA #1 A

EXTRA #2 D

EXTRA #3 A