# Question 1    ADVANCED MATH - HARD - SET 2 - 15 QUESTIONS (25 minutes)

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Equivalent expressions | ■■■ |

**ID: 5355c0ef**

$$0.36x^2 + 0.63x + 1.17$$

The given expression can be rewritten as $a(4x^2 + 7x + 13)$, where $a$ is a constant. What is the value of $a$?

# Question 2

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear equations in one variable and systems of equations in two variables | ■ ■ ■ |

$$2x^2 - 4x = t$$

In the equation above, $t$ is a constant. If the equation has no real solutions, which of the following could be the value of $t$ ?

A. $-3$

B. $-1$

C. 1

D. 3

# Question 3

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Equivalent expressions | ■■■ |

In the expression $3(2x^2 + px + 8) - 16x(p + 4)$, $p$ is a constant. This expression is equivalent to the expression $6x^2 - 155x + 24$. What is the value of $p$ ?

A. $-3$

B. $7$

C. $13$

D. $155$

# Question 4

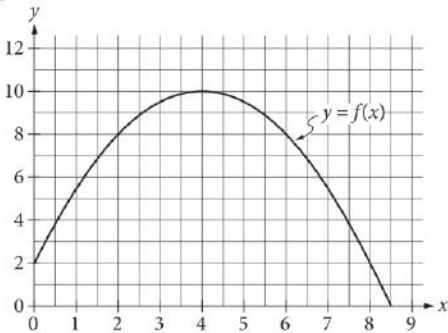| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear equations in one variable and systems of equations in two variables | ■■■ |

$$\sqrt{2x+6} + 4 = x + 3$$

What is the solution set of the equation above?

A. $\{-1\}$

B. $\{5\}$

C. $\{-1, 5\}$

D. $\{0, -1, 5\}$

# Question 5

| Assessment | Test | Domain | Skill | Difficulty |
|------------|------|--------|-------|------------|
| SAT | Math | Advanced Math | Nonlinear equations in one variable and systems of equations in two variables | ■■■ |

The graph of the function $f$, defined by $f(x) = -\dfrac{1}{2}(x-4)^2 + 10$, is shown in the $xy$-plane above. If the function $g$ (not shown) is defined by $g(x) = -x + 10$, what is one possible value of $a$ such that $f(a) = g(a)$?

# Question 6

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear functions | ■■■ |

The population $P$ of a certain city $y$ years after the last census is modeled by the equation below, where $r$ is a constant and $P_0$ is the population when $y = 0$.

$$P = P_0(1+r)^y$$

If during this time the population of the city decreases by a fixed percent each year, which of the following must be true?

A. $r < -1$

B. $-1 < r < 0$

C. $0 < r < 1$

D. $r > 1$

# Question 7

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear equations in one variable and systems of equations in two variables | ■ ■ ■ |

**ID: 3d12b1e0**

$-16x^2 - 8x + c = 0$ In the given equation, $c$ is a constant. The equation has exactly one solution. What is the value of $c$?

# Question 8

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Equivalent expressions | ■■■ |

The expression $\dfrac{x^{-2}y^{\frac{1}{2}}}{x^{\frac{1}{3}}y^{-1}}$ , where $x > 1$ and $y > 1$, is equivalent to which of the following?

A. $\dfrac{\sqrt{y}}{\sqrt[3]{x^2}}$

B. $\dfrac{y\sqrt{y}}{\sqrt[3]{x^2}}$

C. $\dfrac{y\sqrt{y}}{x\sqrt{x}}$

D. $\dfrac{y\sqrt{y}}{x^2\sqrt[3]{x}}$

# Question 9

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear equations in one variable and systems of equations in two variables | ■■■ |

**ID: 71014fb1**

$(x-1)^2 = -4$ How many distinct real solutions does the given equation have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

# Question 10

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Equivalent expressions | ■■■ |

**ID: 22fd3e1f**

$$f(x) = x^3 - 9x$$
$$g(x) = x^2 - 2x - 3$$

Which of the following expressions is equivalent to $\dfrac{f(x)}{g(x)}$, for $x > 3$?

A. $\dfrac{1}{x+1}$

B. $\dfrac{x+3}{x+1}$

C. $\dfrac{x(x-3)}{x+1}$

D. $\dfrac{x(x+3)}{x+1}$

# Question 11

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Equivalent expressions | ■■■ |

The expression $\frac{1}{3}x^2 - 2$ can be rewritten as $\frac{1}{3}(x - k)(x + k)$, where $k$ is a positive constant. What is the value of $k$?

A. 2

B. 6

C. $\sqrt{2}$

D. $\sqrt{6}$

# Question 12

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear equations in one variable and systems of equations in two variables | ■■■ |

**ID: e9349667**

$$y = x^2 + 2x + 1$$
$$x + y + 1 = 0$$

If $(x_1, y_1)$ and $(x_2, y_2)$ are the two solutions to the system of equations above, what is the value of $y_1 + y_2$?

A. $-3$

B. $-2$

C. $-1$

D. $1$

# Question 13

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear equations in one variable and systems of equations in two variables | ■■■ |

If $u - 3 = \dfrac{6}{t-2}$, what is $t$ in terms of $u$?

A. $t = \dfrac{1}{u}$

B. $t = \dfrac{2u+9}{u}$

C. $t = \dfrac{1}{u-3}$

D. $t = \dfrac{2u}{u-3}$

# Question 14

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear functions | ■ ■ ■ |

**ID: 0121a235**

| x | p(x) |
|---|---|
| −2 | 5 |
| −1 | 0 |
| 0 | −3 |
| 1 | −1 |
| 2 | 0 |

The table above gives selected values of a polynomial function $p$. Based on the values in the table, which of the following must be a factor of $p$ ?

A. $(x-3)$

B. $(x+3)$

C. $(x-1)(x+2)$

D. $(x+1)(x-2)$

# Question 15

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Advanced Math | Nonlinear functions | ■■■ |

**ID: 70753f99**

The function $f$ is defined by $f(x) = (x+3)(x+1)$. The graph of $f$ in the $xy$-plane is a parabola. Which of the following intervals contains the $x$-coordinate of the vertex of the graph of $f$?

A. $-4 < x < -3$

B. $-3 < x < 1$

C. $1 < x < 3$

D. $3 < x < 4$