Answer the following 10 questions, limiting your time to 15 minutes. Note that question 1 is a *grid-in* question, in which you provide the numerical solution. (All other questions are in multiple-choice format.)

1. What is the fourth term in a geometric series with first term 2 and third term 72?

2. What is the intersection of the set of all positive integers divisible by 4 and the set of all positive integers divisible by 6?

   (A) All positive multiples of 4
   (B) All positive multiples of 6
   (C) All positive multiples of 8
   (D) All positive multiples of 12
   (E) All positive multiples of 24

3. The shaded regions of the *xy*-plane shown below represent certain values of *x*.
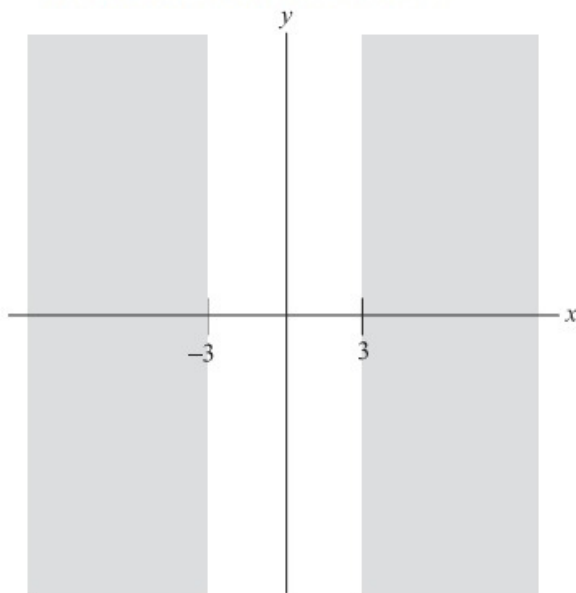
   Which of the following inequalities accounts for all such values of *x*?

   (A) $|y| \geq 3$
   (B) $|x| \geq 3$
   (C) $|x| \leq 3$
   (D) $|y| \leq 3$
   (E) $|y| \leq -3$

4. If $-32 = \left(-\frac{1}{2}\right)^M$, then what is the value of M?

   (A) −16
   (B) −6
   (C) −5
   (D) 5
   (E) 16

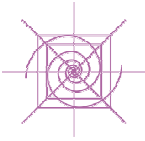5. If $f(x) = \frac{1}{x+1}$, then $f\left(\frac{1}{x+1}\right) =$

   (A) x

   (B) $\frac{x+1}{2}$

   (C) 1

   (D) $x+1$

   (E) $\frac{x+1}{x+2}$

6. If $f(x) = y = 1 - x^2$, and if the domain of x is all real numbers, which of the following sets indicates the range of the function?

   (A) $\{y \mid y \geq 1\}$
   (B) $\{y \mid y > 1\}$
   (C) $\{y \mid y \leq 1\}$
   (D) $\{y \mid y < 1\}$
   (E) $\{y \mid y \geq -2\}$

7. In the linear function f, if $f(-6) = -2$ and the slope of the graph of f in the *xy*-plane is −2, which of the following is true?

   (A) $f(-10) = -6$
   (B) $f(-6) = 0$
   (C) $f(-8) = 2$
   (D) $f(6) = 2$
   (E) $f(8) = 4$

8. Once a certain airplane attains its maximum speed of 300 miles per hour (mph), it begins decreasing speed as it approaches its destination. After every 50 miles, the plane decreases its airspeed by 20 mph. Which of the following equations best defines the number of miles the plane has traveled (m) after beginning to decrease speed as a function of the airplane's airspeed (s)?

(A) $s = -\dfrac{5m}{2} + 750$

(B) $s = -\dfrac{2m}{5} + 300$

(C) $m = -\dfrac{5s}{2} + 750$

(D) $m = -\dfrac{5s}{2} + 300$

(E) $m = \dfrac{2s}{5} + 300$

9. In the xy-plane, the graph of $3x = 2y^2$ shows a parabola with vertex at the point defined by the (x, y) pair:

(A) $(0,0)$
(B) $(0,2)$
(C) $(2,0)$
(D) $(3,2)$
(E) $(2,3)$

10. A model rocket is shot straight up in the air from ground level. After 2 seconds and then again after 3 seconds, its height is 96 feet. Which of the following equations could define rocket's height, (h), as a function of the number of seconds after launch (t)?

(A) $h = 10t^2 - 74t$
(B) $h = 8t^2 - 64t$
(C) $h = 64t - 8t^2$
(D) $h = 80t - 16t^2$
(E) $h = 96t - 10t^2$