TMUA Practice - Algebra & Functions

1. Given that p and q are non-zero integers, the expression $\dfrac{(36^{p-q})(3^q)}{(12^{2p-q})(6^p)}$

is an integer if:

A $p < 0$
B $q < 0$
C $p > 0$ and $q < 0$
D $p > 0$ and $q > 0$
E $p > 0$
F $q > 0$

2. Given that $m = 7^8$ and $n = 8^7$ which expression represents 56^{56}

A mn
B $(mn)^{56}$
C m^7n^8
D $8m^7 + 7n^8$
E $(8m)^7(7n)^8$

3. Find the set of values of x that satisfy both the following inequalities:

$$\frac{4x+1}{x-1} < 3 \qquad (x+2)(x-4) > 0$$

A $x < -4$
B $x > -4$
C $-2 < x < 1$
D $-4 < x < 4$
E $-4 < x < -2$

4. Find the set of values of x that satisfy the following inequality:

$$\frac{3}{x+3} > \frac{x-4}{x}$$

A $-3 < x < 6$

B $-2 < x < 6$

C $-3 < x < -2$ and $0 < x < 6$

D $0 < x < 2$ and $3 < x < 6$

E $2 < x < 3$ and $5 < x < 6$

5. Find the set of values of x that satisfy the following inequality, where p is a positive constant:

$$\frac{x+p}{x+4p} < \frac{p}{x}$$

A $-2p < x < 2p$

B $0 < x < 2p$

C $x < -4p\ ,\ x > 0$

D $-4p < x < -2p\ ,\ 0 < x < 2p$

E $-4p < x < 0\ ,\ x > 2p$

6. A cubic curve has equation $y = x^3 + kx - 2$ where k is a constant.
What value of k gives this curve exactly two distinct real roots

A -3

B -2

C -1

D 1

E 3

7. The equation $2x^2 + 9x - k = 0$ where k is a constant has two distinct real roots.

One root is 4 more than the other root. The value of k is

A $\frac{55}{8}$ B $\frac{9}{2}$ C $-\frac{17}{8}$ D $-\frac{17}{4}$ E $-\frac{55}{8}$

8. Find the minimum value of $2(2^{sinx}) - 4^{sinx} + \frac{10}{3}$

A $\frac{10}{3}$ B $\frac{13}{3}$ C $\frac{49}{12}$ D $\frac{20}{3}$ E 0

9. When $(2x^2 + 6x - 3)$ is multiplied by $(px - 1)$ and the resulting product is divided by $(x + 1)$ the remainder is 28.

The value of p is

A 3 B 2 C $\frac{7}{4}$ D $\frac{3}{2}$ E $\frac{28}{5}$

10. The simultaneous equations below have two distinct real solutions

$3x^2 - xy = 4$ and $2x - y = p$ where p is a real constant

What are the values that p can take

A there are no possible values for p

B $p < -4, p > 4$

C $-4 < p < 4$

D p can take any value

11. What is the sum of the solutions of the following equation

$$|x| - 3 = |2x + 12|$$

A - 14

B - 4

C 0

D 4

E 14

12. How many solutions are there to the following equation:

$$|x| + |x - 1| = |x^3|$$

A 0

B 1

C 2

D 3

E 4

13. Given that $\left(a^3+\frac{3}{b^3}\right)\left(b^3-\frac{3}{a^3}\right)=2\sqrt{3}$ where a, b are real numbers, then the least value of ab is

A $-\sqrt{3}$
B $\sqrt{3}$
C $-3\sqrt{3}$
D $3\sqrt{3}$
E $-3^{\frac{1}{6}}$
F $3^{\frac{1}{6}}$

14. The function f is defined such that $3f(x)+2f(-x)=5x-10$
find the value of $f(1)$

A 0
B 1
C 2
D 3
E 4

15. The function f satisfies $2f(x)-f\left(\frac{2x+3}{x-2}\right)=2x-2, \quad x\in\mathbb{R}$
What is the value of $f(9)$

A 16
B 12
C 8
D -12
E -16