Foundation-level examination by course unit 2011

SEF026   Essential Foundation Mathematics

Duration: 2 hours

Date and time: 14 December 2011,   1400h–1600h

Apart from this page, you are not permitted to read the contents of this question paper until instructed to do so by an invigilator.

You should attempt all questions. Record each answer by ticking the corresponding box on the answer form. To pass the examination you need 18 correct answers.

Calculators are NOT permitted in this examination. The unauthorized use of a calculator constitutes an examination offence.

Candidates should note that the Examination and Assessment Regulations state that possession of unauthorized materials by any candidate who is under examination conditions is an assessment offence. Please check your pockets now for any notes that you may have forgotten that are in your possession. If you have any, then please raise your hand and give them to an invigilator now.

Exam papers must not be removed from the examination room.

Examiner(s): I. Tomasic

1. Compute the quotient of the following division

$$(x^3 + 28) \div (x + 3).$$

[a] $x^2 + 8$ [b] $x^2 + 1$

[e] not in the list

[c] $x^2 + 3x + 7$ [d] $x^2 - 3x + 9$

2. Compute the remainder of the following division

$$(X^4 - 16X^2 + 3X) \div (X - 4).$$

[a] 12 [b] $X + 1$

[e] not in the list

[c] -8 [d] $X - 1$

3. Compute the quotient of the following division

$$(4x^5 - x^4 + x^2 + 1) \div (x^3 + x^2 - 3).$$

[a] $4x + 6$ [b] $4x^2 - 5x + 5$

[e] not in the list

[c] $4x^2 + 4x + 1$ [d] $4x - 6$

4. Compute the remainder of the following division

$$(x^4 - 3x^3 + 2x + 1) \div (x^2 + 1).$$

[a] 8 [b] -8

[e] not in the list

[c] $5x + 2$ [d] $x + 8$

5. When $12xy^3 - 3xy$ is factored completely, which of the following is one of the factors?

[a] $2y + 1$ [b] $y - 2$

[e] not in the list

[c] $4y^2 - 1$ [d] $4y^2 + 1$

6.   When $15x^2 - 41xy + 14y^2$ is factored completely, which of the following is one of the factors?

[a] $x + y$ [b] $x - y$

[c] $3x - 7y$ [d] $-3x - 4y$

[e]   not in the list

7.   When $2x^4y^2 - 8x^3y^2 + 6x^2y^2$ is factored completely, which of the following is one of the factors?

[a] $2x + 1$ [b] $x - 1$

[c] $x + 3$ [d] $2x^3$

[e]   not in the list

8.   When $c^3ab^4 - ba^4c^3$ is factored completely, which of the following is one of the factors?

[a] $a - c$ [b] $a + b$

[c] $b^2 - ab + a^2$ [d] $b^2 + ab + a^2$

[e]   not in the list

9. Simplify

$$\frac{2y - 7}{y^2 + 8y + 16} - \frac{3y - 5}{y^2 - 16}.$$

[a] $\dfrac{-2}{(y^2 + 8y + 16)(y^2 - 16)}$ [b] $\dfrac{2y^3 - 4}{(y^2 + 8y + 16)(y^2 - 16)}$

[c] $\dfrac{-y^2 + 5y - 27}{(y + 4)^2(y - 4)}$ [d] $\dfrac{-y^2 - 22y + 48}{(y + 4)^2(y - 4)}$

[e]   not in the list

10. Simplify
$$\frac{2t}{2+t} + \frac{t}{t+3} + \frac{4}{t^2+5t+6} \ .$$

[a] $\dfrac{t^2(t+1)}{(2+t)(t+3)(t^2+5t+6)}$ [b] $\dfrac{t^2(t+2)}{(t^2+5t+6)}$

[c] $\dfrac{3t+2}{t+3}$ [d] $\dfrac{t^2}{2}$

[e] not in the list

11. Simplify
$$\frac{\dfrac{a}{x} - \dfrac{a}{y}}{\dfrac{y-x}{a}} \ .$$

[a] $a^2(x+y)$ [b] $\dfrac{a^2}{x+y}$

[e] not in the list

[c] $\dfrac{x^2-y^2}{a^2}$ [d] $\dfrac{a^2}{(y-x)^2}$

12. Simplify
$$\left(\frac{x^5}{-y^{-2}}\right) \div \left(\frac{y^{-1}}{-x^4}\right) \ .$$

[a] $-\dfrac{x^7}{y^{-2}}$ [b] $\dfrac{x^9}{y^3}$

[e] not in the list

[c] xy [d] x^9y^3

13. Compute $f(-3)$, where
$$f(x) = \frac{x^3 + 3x^2 - x + 1}{x+1} \ .$$

[a] 2   [b] -2

[e] not in the list

[c] -29 [d] 29

14. Compute $f\left(\dfrac{a}{a+1}\right)$, where

$$f(x) = x - \frac{x}{x^2}.$$

[a] $\dfrac{a^2}{1+2a+a^2} - 1$ [b] $\dfrac{a^2+1}{a^2+2a+1}$

[e]   not in the list

[c] $-\dfrac{2a+1}{a(a+1)}$ [d] $\dfrac{(a+2)}{(a+1)^2}$

15. Substitute $a := -1$, $b := 1$ and simplify

$$\left(a + \left(a + \left(a + b^2\right)^2\right)^2\right)^2.$$

[a]   0   [b]   1

[e]   not in the list

[c]   64   [d]   81

16. Substitute $x := \dfrac{1+t^2}{1-t^2}, \quad y := \dfrac{2t}{1-t^2}$ and simplify

$$x^2 - y^2.$$

[a]   1   [b] $\dfrac{1+4t^3}{1-t^2}$

[e]   not in the list

[c] $\dfrac{1+4t^2+t^4}{(1-t^2)^2}$ [d] $\dfrac{1-4t^4}{(1-t^2)^2}$

17. Solve for x

$$\frac{x-3}{x+5} = \frac{x+2}{x-4}.$$

[a] $x = \dfrac{1}{9}$ [b] $x = -\dfrac{1}{9}$

[e]   not in the list

[c] $x = \dfrac{1}{7}$ [d]   no solution

18. Solve
$$\frac{x}{2} + 4 - 3x > 5x - \frac{3}{2}.$$

[a] $x < \dfrac{5}{3}$ [b] $x > 3$

                                             [e] not in the list

[c] $x > \dfrac{9}{5}$ [d] $x < \dfrac{11}{15}$

19. Solve for x and y in
$$2x = 3 - 2y, \qquad -x + 3y = 0.$$

[a] $x = 1, \quad y = 7$ [b] $x = \dfrac{9}{8}, \quad y = \dfrac{3}{8}$

[c] $x = -\dfrac{1}{8}, \quad y = -\dfrac{3}{8}$ [d] $x = -1, \quad y = \dfrac{47}{8}$

[e] not in the list

20. Solve for x and y in
$$x - 4y = 3(x + y) - 6, \qquad -9y = 4x - 5.$$

[a] $x = \dfrac{3}{10}, \quad y = -\dfrac{3}{10}$ [b] $x = -\dfrac{19}{10}, \quad y = \dfrac{7}{5}$

[c] $x = \dfrac{3}{5}, \quad y = \dfrac{2}{5}$ [d] $x = -\dfrac{3}{11}, \quad y = -\dfrac{3}{7}$

[e] not in the list

21. Solve
$$x^2 - 12x + 27 = 0.$$

[a] $x = 5, \quad x = -2$ [b] $x = 3, \quad x = 9$

[c] $x = -5, \quad x = 2$ [d] $x = -10, \quad x = 1$

[e] not in the list

22. Solve
$$x = (x+1)^2.$$

[a] $x = -1 \pm \sqrt{6}$ [b] $x = -1, \ x = -2$

[c] $x = \dfrac{3 \pm \sqrt{5}}{2}$ [d]   no real solution

[e]   not in the list

23. Solve
$$x^2 + 6x - 8 = 0.$$

[a] $x = -3 \pm \sqrt{17}$ [b] $x = 3 \pm 2\sqrt{2}$

[c] $x = -3 \pm \sqrt{2}$ [d]   no real solution

[e]   not in the list

24. Solve
$$\frac{x-1}{x-2} = \frac{x-3}{x-4}.$$

[a] $x = 4, \ x = -2$ [b] $x = 2 \pm \sqrt{15}$

[c] $x = -2 \pm \sqrt{15}$ [d]   no solution

[e]   not in the list

25. Determine the number of primes lying between 1 and 22, end-points included.

[a]   4   [b]   5

[e]   not in the list

[c]   6   [d]   7

End of Paper