Sultan Qaboos University
Centre for Preparatory Studies – Department of Mathematics and IT
Mathematics for Sciences – FPMT0108
EXIT TEST
(Sample)

Instructions:

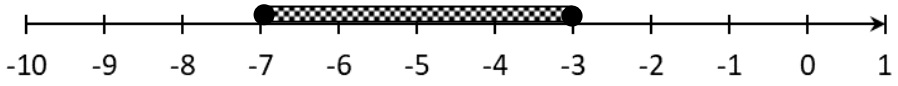
- This test is an on-line test, which contains 50 multiple choice questions.
- Attempt all questions. Time allowed is 110 minutes.
- Choose the most appropriate answer for each multiple choice question.
- Rough work done on the given extra sheet will not be graded.

1. Simplify the expression: $\dfrac{1}{x^2-2x-3}-\dfrac{1}{x-3}$.

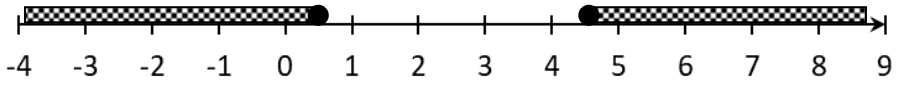
(A) $\dfrac{x}{(x-3)(x+1)}$ **(B)** $\dfrac{x}{(x-3)(x-1)}$ **(C)** $\dfrac{x}{(3-x)(x+1)}$ **(D)** $\dfrac{x}{(3-x)(x-1)}$

2. Determine the solution set of the inequality $7-|5-2x|\le 3$.

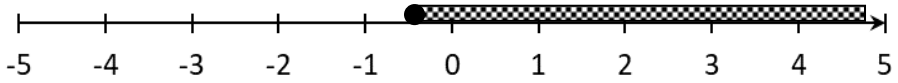
(A)



(B)



(C)



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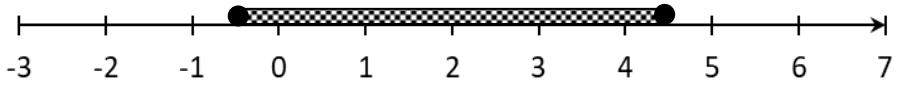


3. The center of the circle $x^2+y^2+4x+4y=1$ is

(A) $(2,\ 2)$ **(B)** $(-2,-2)$ **(C)** $(4,\ 4)$ **(D)** $(-4,-4)$

4. The line $y+2x+1=0$ is perpendicular to the line

(A) $x-2y+7=0$ **(B)** $x+2y-1=0$

(C) $y-2x-1=0$ **(D)** $y+2x-1=0$

5. Find the solution set of the in equality: $\frac{2x+3}{x-1} > 1$

(A) $(-\infty, -1) \cup (4, \infty)$ **(B)** $(-4, 1)$ **(C)** $(-4, \infty)$ **(D)** $(-\infty, -4) \cup (1, \infty)$

6. Rationalize the denominator: $\frac{5a}{\sqrt[7]{x^3}}$

(A) $\frac{5a\sqrt[7]{x^4}}{x}$ **(B)** $\frac{5a\sqrt[7]{x}}{x}$ **(C)** $\frac{5a\sqrt[7]{x}}{x^3}$ **(D)** $\frac{5a\sqrt[7]{x^3}}{x}$

7. List all elements of the set $\left\{\pi, -7, \sqrt{2}, 11, \cos\left(\frac{\pi}{2}\right), \sqrt{25}, 6.78, 21, -4, \frac{22}{7}, \sqrt{7}\right\}$ which are integers.

(A) $\left\{-7, -4, \sqrt{25}, \pi, 6.78\right\}$ **(B)** $\left\{6.78, \pi, \sqrt{2}, \sqrt{7}, \sqrt{25}\right\}$

(C) $\left\{21, -7, 6.78, 11, -4, \frac{22}{7}\right\}$ **(D)** $\left\{-7, 11, -4, \cos\left(\frac{\pi}{2}\right), \sqrt{25}, 21\right\}$

8. Find the range of the function $g(x) = 2\sqrt{x-1} + 3$.

(A) $[2, \infty)$ **(B)** $[3, \infty)$ **(C)** $[2, \infty)$ **(D)** $(-\infty, 3]$

9. Which one of the following polynomials is divisible by $(x+1)$?

(A) $P(x) = 2x^{56} + 4x^{32} - 2$ **(B)** $P(x) = 2x^{29} + 3x^{11} - 5x$

(C) $P(x) = x^{12} - 7x^5 + x^2 - 2$ **(D)** $P(x) = x^{11} + 4x^{17} - 7$

10. The domain of the function $f(x) = \ln(2-x)$ is

(A) $x > 0$ **(B)** $x \geq 0$ **(C)** $x < 2$ **(D)** $x < -2$

11. Find the solution(s) of the equation $\sqrt{2x+4} = x-2$.

(A) $x = 6,\ x = 0$ **(B)** $x = -6$ **(C)** $x = 6$ **(D)** $x = 0$

12. If $f(x) = x^2 + 1$, evaluate $f(x+5)$ and simplify.

(A) $f(x+5) = x^2 + 10x + 26$ **(B)** $f(x+5) = x^2 + 6$

(C) $f(x+5) = x^2 - 10x + 26$ **(D)** $f(x+5) = x^2 + 10x + 25$

13. The graph of a function $g(x)$ is obtained from the graph of $f(x) = |x|$ by shifting six units to the right and one unit upward. What is the equation of $g(x)$?

(A) $g(x) = |x+1| - 6$ **(B)** $g(x) = |x+6| - 1$ **(C)** $g(x) = |x-6| + 1$ **(D)** $g(x) = 1 - |x-6|$

14. Find the minimum value of the function $f(x) = 7x^2 - 28x$.

(A) $f(2) = 28$ **(B)** $f(-28) = -2$ **(C)** $f(-28) = 2$ **(D)** $f(2) = -28$

15. Use $f(x) = 2x - 8$ and $g(x) = 4 - x^2$ to evaluate $f(g(-1))$.

(A) -7 **(B)** -28 **(C)** -2 **(D)** -96

16. Assume f is one-to-one function. If $f(x) = 3 - 6x$, find $f^{-1}(33)$.

(A) -5 **(B)** 5 **(C)** 6 **(D)** $-\frac{1}{195}$

17. Which of the following equations does NOT define y as a function of x?

(A) $y - \sqrt{x+9} = 12$ **(B)** $x^2 + y = 8$ **(C)** $y = \frac{2x}{x-1}$ **(D)** $x + |y| = 3$

18. The Remainder in the division of $P(x) = 6x^5 + 4x^3 + x + 8$ by $(x - 2)$ is

(A) 232 **(B)** 233 **(C)** 237 **(D)** 234

19. Find a polynomial of degree five that has zeros: $-6, -2, 0, 2,$ and 6 .

(A) $x^5 - 40x^3 - 144x$ **(B)** $x^5 - 40x^3 + 144x$

(C) $x^5 + 40x^3 + 144x$ **(D)** $x^5 - 40x^2 - 144x$

20. List all possible zeros given by the Rational Zeros Theorem for $P(x) = 2x^5 + 8x^3 + 11x^2 - 14$

(A) $x = \pm 1, \pm 2, \pm 7, \pm 14, \pm\frac{1}{2}, \pm\frac{7}{2}$ **(B)** $x = \pm 1, \pm 2, \pm 7, \pm 14, \pm\frac{1}{32}$

(C) $x = \pm 1, \pm 2, \pm 7, \pm\frac{1}{31}$ **(D)** $x = \pm 1, \pm 2, \pm 14, \pm\frac{1}{31}$

21. If $f(x) = \frac{x}{x^2 - 9}$ and $g(x) = \sqrt{x+5}$, then the domain of the composite function $(f \circ g)(x)$ is

(A) $[-5, 4) \cup (4, \infty)$ **(B)** $[-5, \infty)$ **(C)** $(-\infty, -3) \cup (3, \infty)$ **(D)** $(-5, -3) \cup (3, \infty)$

22. Find all real zeros of the polynomial $P(x) = x^3 + 6x^2 + 7x - 4$

(A) $x = 4, \quad x = -4 \pm \sqrt{2}$ **(B)** $x = -1, \quad x = -4 \pm \sqrt{2}$

(C) $x = -4, \quad x = -1 \pm \sqrt{2}$ **(D)** $x = -4, \quad x = 4 \pm \sqrt{2}$

23. What is the horizontal asymptote of the function $r(x) = \frac{6 + 5x - 2x^2}{x^2 - 1}$.

(A) $y = 2$ **(B)** $x = -1, x = 1$ **(C)** $y = -2$ **(D)** *None*

24. The equation $\ln(1-x)=-1$ has the solution

(A) $x=e^{-1}-1$ **(B)** $x=1-e^{-1}$ **(C)** $x=1-e$ **(D)** *No solution*

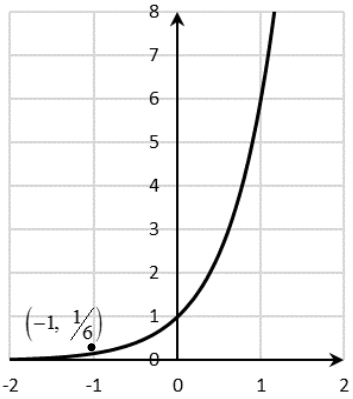
25. Rewrite the expression $4\log x+\frac{1}{2}\log y-3\log z$ as a single logarithm.

(A) $\log\left(\frac{x^4\sqrt{y}}{z^3}\right)$ **(B)** $\frac{\log\left(x^4\sqrt{y}\right)}{\log z^3}$ **(C)** $\log\left(4x+\frac{1}{2}y-3z\right)$ **(D)** $\log\left(x^4+\sqrt{y}-z^3\right)$

26. Simplify: $(\log_3 7)(\log_7 13)$

(A) $\log_3 20$ **(B)** $\frac{3}{13}$ **(C)** $\frac{1}{7}$ **(D)** $\log_3 13$

27. Find the exponential function $f(x)=a^x$ whose graph is given.



(A) $f(x)=6^x$ **(B)** $f(x)=6^{x-1}$ **(C)** $f(x)=6^{-x}$ **(D)** $f(x)=-6^x$

28. Solve the logarithmic equation: $\log_x(2x+24)=2$

(A) $x=-4,\ 6$ **(B)** $x=6$ **(C)** $x=-4$ **(D)** $x=-6,\ 4$

29. Radium-221 has a half-life of 30 seconds. How long will it take for 95 % of a sample to decay?

(A) 130 s **(B)** 45 *s* **(C)** 2 *s* **(D)** 100 *s*

30. Find $\sin\theta$ if $\cos\theta=-\frac{3}{5}$ and angle θ is in Quadrant III.

(A) $-\frac{12}{5}$ **(B)** $\frac{4}{5}$ **(C)** $-\frac{4}{5}$ **(D)** $-\frac{3}{5}$

31. The period of function $y=4\sin\left(\frac{\pi}{2}x+\pi\right)$ is

(A) 4π **(B)** π **(C)** 2π **(D)** 4

32. Use the substitution $x=\sin t$ to simplify the expression $\frac{x}{\sqrt{1-x^2}}$.(Assume $0\le x<\frac{\pi}{2}$)

(A) 1 **(B)** $\cos t$ **(C)** $\sec t$ **(D)** $\tan t$

33. A 25-meter tree casts a shadow that is $25\sqrt{3}$ meters long. What is the angle of elevation of the Sun?

(A) $60°$ **(B)** $40°$ **(C)** $30°$ **(D)** $45°$

34. The solution of the equation $e^{2x}+2e^{x}-35=0$ is

(A) 5 **(B)** $\ln 5$ **(C)** -7 **(D)** -7 *and* 5

35. Evaluate $\cos\left(\theta+\frac{5\pi}{3}\right)$ if $\sin\theta=\frac{1}{4}$ and θ is in quadrant II.

(A) $\frac{\sqrt{3}+\sqrt{15}}{8}$ **(B)** $\frac{\sqrt{3}-\sqrt{15}}{8}$ **(C)** $\frac{\sqrt{15}-\sqrt{3}}{8}$ **(D)** $\frac{\sqrt{3}}{4}$

36. The expression $(\tan\alpha-\tan\beta)$ is equivalent to

(A) $\frac{\cos(\alpha-\beta)}{\cos\alpha\cos\beta}$ **(B)** $\frac{\sin(\alpha-\beta)}{\cos\alpha\cos\beta}$ **(C)** $\frac{\sin(\alpha+\beta)}{\cos\alpha\cos\beta}$ **(D)** $\frac{\sin(\alpha+\beta)}{\cos\alpha\sin\beta}$

37. Rewrite the expression $\sin\left(\cos^{-1}x\right)$ as an algebraic expression in term of x .

(A) $\sqrt{1-x^{2}}$ **(B)** $\sqrt{x^{2}-1}$ **(C)** $1-x$ **(D)** $x-1$

38. Find all solutions of the equation $2\cos^{2}x=1-\cos x$ in the interval $[0,2\pi)$

(A) $x=\frac{\pi}{3}+2k\pi,\ (2k+1)\pi,\ \frac{5\pi}{3}+k\pi$ **(B)** $x=\frac{\pi}{3}+2k\pi,\ \frac{5\pi}{3}+2k\pi,\ \frac{\pi}{4}+2k\pi$

(C) $x=\frac{\pi}{3},\ \pi,\ \frac{5\pi}{3}$ **(D)** $x=\frac{\pi}{3},\ \frac{5\pi}{3},\ \frac{3\pi}{4},\ \frac{7\pi}{4}$

39. In a triangle ABC, let a, b, and c be the sides opposite to the angles A, B, and C respectively. Use the Law of cosine to find angle B, if $a=1,\ b=\sqrt{3},$ and $c=2.$

(A) $30°$ **(B)** $60°$ **(C)** $45°$ **(D)** $90°$

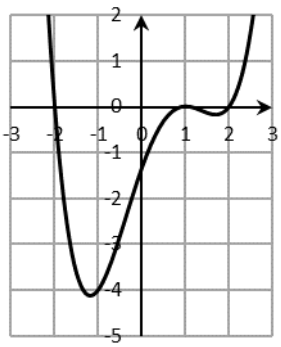
40. The sum of the ages of a father and his daughter is 50 years. Five years ago, the father was 4 times as old as his daughter was. What is the present age of the daughter?

(A) 35 **(B)** 10 **(C)** 15 **(D)** 13

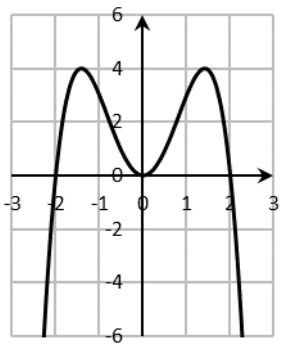
41. If $f(x)=\sqrt{x+6}$ and $g(x)=\frac{x+9}{x-1}$, find the domain of function $\left(\frac{f}{g}\right)(x)$.

(A) $[-6,\ 1)\cup(1,\infty)$ **(B)** $(-6,\ 1)\cup(1,\infty)$ **(C)** $(-9,\ 1)\cup(1,\infty)$ **(D)** $[-6,+\infty)$

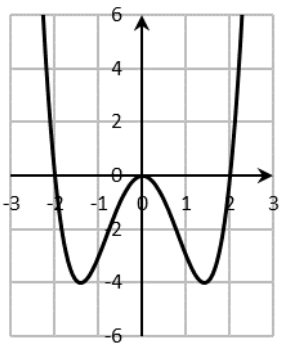
42. Which of the following is the graph of the polynomial function $f(x) = x^2\left(4 - x^2\right)$?



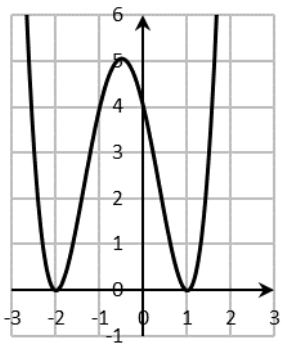
(A)



(B)



(C)

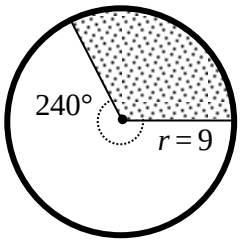


(D)

43. A circular arc of length 18 meters subtends a central angle of $135°$. Find the radius of the circle.

(A) $\frac{12}{\pi}\ (m)$ **(B)** $\frac{18}{\pi}\ (m)$ **(C)** $\frac{6}{\pi}\ (m)$ **(D)** $\frac{24}{\pi}\ (m)$

44. Compute the area of the shaded region.



(A) 54π **(B)** 4860 **(C)** 27π **(D)** $\frac{27\pi}{2}$

45. A rectangular garden is 2.5 times as long as it is wide. If the perimeter of the garden is 84 meters, find the area of the garden.

(A) 210 (m^2) **(B)** 525 (m^2) **(C)** 360 (m^2) **(D)** 180 (m^2)

46. The estimated population of Oman (in millions) can be approximated by the model $P = 4.54e^{0.039t}$, where t is the number of years after 2020. Predict the population of Oman for the year 2030.

(A) 45.4 **(B)** 6.71 **(C)** 6.21 **(D)** 47.21

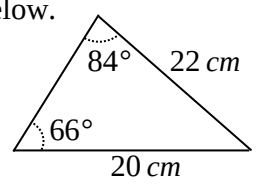
47. In a sample of 12 observations, the smallest observation is increased by 60. Then the mean will be

(A) *remain the same* **(B)** *increase by* 12 **(C)** *increase by* 60 **(D)** *increase by* 5

48. Find the value of $\sin 2\theta$ if $\tan\theta = -\frac{5}{12}$ and θ is in quadrant IV.

(A) $-\frac{120}{169}$ **(B)** $\frac{120}{169}$ **(C)** $-\frac{2\sqrt{30}}{13}$ **(D)** $\frac{2\sqrt{30}}{13}$

49. Compute the area of the triangle shown below.



(A) 440 **(B)** 110 **(C)** 220 **(D)** 55

50. A small school bus contains eight boys and ten girls. If two children are ill, what is the probability that at least one of them is a girl?

(A) $\frac{28}{153}$ **(B)** $\frac{125}{153}$ **(C)** $\frac{16}{153}$ **(D)** $\frac{27}{306}$

End of Test

Mathematics for Sciences – FPMT0108
EXIT TEST
(Sample)
ANSWER KEY

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
C	**B**	**B**	**A**	**D**	**A**	**D**	**B**	**B**	**C**
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
C	**A**	**C**	**D**	**C**	**A**	**D**	**D**	**B**	**A**
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
A	**C**	**C**	**B**	**A**	**D**	**A**	**B**	A	**C**
Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
D	**D**	**C**	**B**	**B**	**B**	**A**	**C**	**B**	**D**
Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50
A	**B**	**D**	**C**	**C**	**B**	**D**	**A**	**B**	**B**