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 40 multiple choice questions.
- Attempt all questions. Time allowed is 90 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. The center of the circle $x^2+y^2+4x+4y=1$ is

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

3. 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)** $y+2x-1=0$

4. Find the solution set of the in equality: $\dfrac{1}{2}<\dfrac{2-3x}{4}$

(A) $(-\infty,\ 0)$ **(B)** $(-\infty,\ 1]$ **(C)** $(1,\ \infty)$ **(D)** $[1,\ \infty)$

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

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

6. 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)** $P(x)=x^{11}+4x^{17}-7$

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

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

8. 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)** $f(x+5)=x^2+10x+25$

9. Graph of $f(x)=|x|$ shifted to the right 6 units, and shifted upward 1 unit, then an equation of the final transformation is

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

10. 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)** $f(2)=-28$

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

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

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

(A) 5 **(B)** -5 **(C)** 6 **(D)** -3

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

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

14. 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

15. 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

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

(A) $x=\pm1,\ \pm2,\ \pm7,\ \pm\dfrac{1}{31}$ **(B)** $x=\pm1,\ \pm2,\ \pm7,\ \pm14,\ \pm\dfrac{1}{32}$

(C) $x=\pm1,\ \pm2,\ \pm7,\ \pm14,\ \pm\dfrac{1}{2},\ \pm\dfrac{7}{2}$ **(D)** $x=\pm1,\ \pm2,\ \pm14,\ \pm\dfrac{1}{31}$

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

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

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

18. Find the slant asymptote of the function $r(x)=\dfrac{x^2+10x+24}{x+7}$.

(A) $y=x-1$ **(B)** $y=x+4$ **(C)** $y=x+3$ **(D)** $y=x-3$

19. 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*

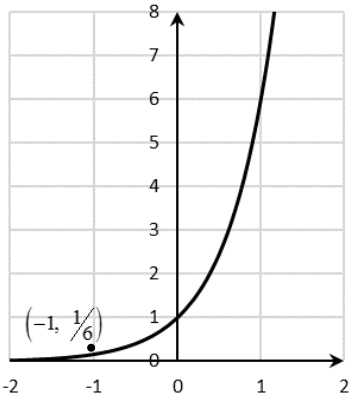
20. Rewrite the expression $4\log x+\dfrac{1}{2}\log y-3\log z$ as a single logarithm.

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

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

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

22. 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)** $f(x)=-6^x$

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

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

24. 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*

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

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

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

(A) 4π **(B)** π **(C)** 2π **(D)** 4

27. 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)** $\tan t$

28. 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°

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

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

30. Express the function $g(x) = \sin x + \sqrt{3}\cos x$ in terms of *sine* only.

(A) $g(x) = 2\sin\left(x + \pi/3\right)$ **(B)** $g(x) = 4\sin\left(x - \pi/6\right)$

(C) $g(x) = 2\sin(2x + \pi)$ **(D)** $g(x) = 2\sin(x + \pi)$

31. 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)** $\frac{\sin(\alpha + \beta)}{\cos\alpha\sin\beta}$

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

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

33. Find all solutions of the equation $2\cos x\cot x - \cot x = 1 - 2\cos x$ in the interval $[0, 2\pi)$

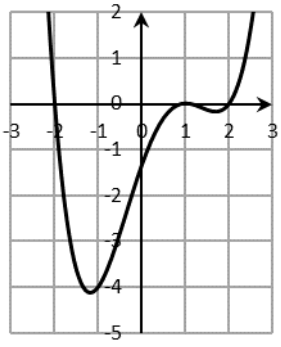
(A) $x = \frac{\pi}{3} + 2k\pi,\ \frac{5\pi}{3} + 2k\pi,\ \frac{\pi}{4} + k\pi$ **(B)** $x = \frac{\pi}{3} + 2k\pi,\ \frac{5\pi}{3} + 2k\pi,\ \frac{\pi}{4} + 2k\pi$

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

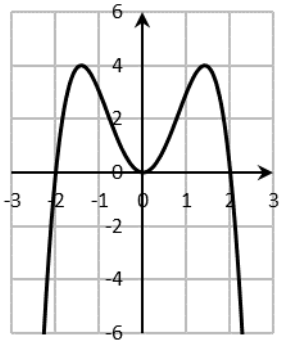
34. In a triangle, let a, b, and c be the sides opposite to the angles A, B, and C respectively. Use *the Law of cosine* to find B if $a = 1,\ b = \sqrt{3},$ and $c = 2.$

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

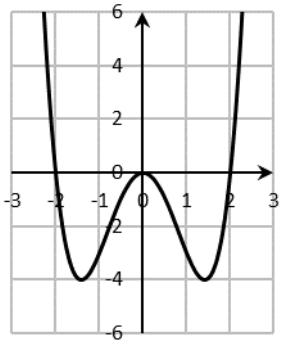
35. Which of the following is the graph of the polynomial function $f(x) = x^2\left(4 - x^2\right)$?



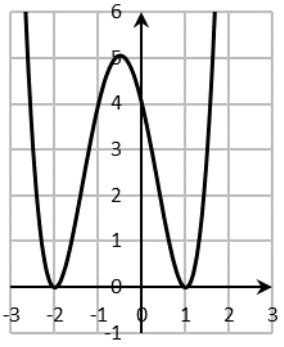
(A)



(B)



(C)



(D)

36. 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)** $\frac{24}{\pi}\ (m)$

37. 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)** $[-6, +\infty)$

38. The estimated population of Oman (in millions) can be approximated by the model $P = 3.69e^{0.052t}$, where t is the number of years after 2013. Predict the population of Oman for the year 2023.

(A) 9.16 **(B)** 7.20 **(C)** 6.21 **(D)** 38.87

39. 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

40. 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**	**A**	**A**	**B**	**B**	**D**	**A**	**C**	**D**
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
C	**B**	**A**	**D**	**B**	**C**	**B**	**C**	**B**	**A**
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
D	**A**	**B**	**A**	**C**	**D**	**D**	**C**	**B**	**A**
Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
B	**B**	**D**	**B**	**B**	**D**	**A**	**C**	**D**	**B**