مدارس التكنولوجيا التطبيقية
Applied Technology Schools

Applied Technology School

ATHS -Ajman

AY2025-2026

Grade 11 Advance – MAT 61

Mathematics

EOT 1 Exam – Practice Question

List of Formulae

Exponential & Logarithmic Functions

The average rate of change of the function $f(x)$ on the interval [c, d] is: $\frac{f(d)-f(c)}{d-c}$

Compound interest Formula $\mathrm{A} = \mathrm{P}\left(1+\frac{\mathrm{r}}{\mathrm{n}}\right)^{\mathrm{n}\cdot\mathrm{t}}$

Continuous compound Interest Formula $A = Pe^{r\cdot t}$

$a^x = b \Leftrightarrow x = \log_a b\,, where\ a > 0, b > 0, a \neq 1$

$\log_b mn = \log_b m + \log_b n$

$\log_b \frac{m}{n} = \log_b m - \log_b n$

$\log_b m^n = n \log_b m$

$\log_b m = \frac{\log_c m}{\log_c b}$

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AY2025-2026
Detailed KPIs for T1-EoT Exam

MAT– 61

KPI No.	KPI Statement
Subtopic 1.1 - Operation on Functions	
1.1.1	Find sums, differences, products, and quotients of functions
1.1.3	Compose functions that are defined in terms of variable or in a set notation
Subtopic 1.2 - Inverse Relations and Functions	
1.2.6	Find the equation of the inverse of a linear function
Subtopic 1.3 - nth Roots and Rational Exponents	
1.3.1	Identify the nth root of a real number
1.3.2	Demonstrate an understanding of the components of a radical expression by recognizing the index, radical sign and the radicand
1.3.5	Find and simplify roots (Use absolute value when needed)
1.3.7	Realize that for any nonzero number b, and any integers x and y with y>1, $\boldsymbol{bx}$ $\boldsymbol{y}=\sqrt{\boldsymbol{bx}}$ $\boldsymbol{y}$ $=(\sqrt{\boldsymbol{b}}$ $\boldsymbol{y}$ $)\boldsymbol{x}$ except when b <0 and y is even. When b<0 and y is even, then a complex root may exist
1.3.8	Express a radical expression (numerical and algebraic) in its exponential form and vice versa
1.3.10	Simplify expressions with rational exponents
1.3.11	Simplify radical expressions
Subtopic 1.4 - Graphing Radical Functions	

1.4.1	Recognize that a square root function is a type of radical functions.
1.4.3	Analyze a square root function by finding its domain, range, intercepts, end behavior, intervals where its increasing or decreasing, intervals where its positive or negative, min or max, and test it symmetry
1.4.4	Write the equation of a square root function given its graph
Subtopic 1.5 - Operations with Radical Expressions	
1.5.2	Use the product property of radicals to multiply monomials involving radicals
1.5.6	Multiply monomials involving radicals
1.5.7	Use the distributive property to multiply numerical and algebraic radical expressions
Subtopic 1.6 -Solving Radical Equation	
1.6.1	Solve radical equations (square root) in one variable and identify extraneous solutions
1.6.2	Solve radical equations (nth root) in one variable and identify extraneous solutions
Subtopic 2.1 - Graphing Exponential Functions	
2.1.1	Identify the exponential function and distinguish between growth and decay functions • Determine whether a given function represents an exponential growth or decay
2.1.3	Identify the domain, range, intercepts, asymptotes, and end behavior for an exponential function
Subtopic 2.2 - solving Exponential Equations and Inequalities	
2.2.1	Solve exponential equations algebraically
2.2.3	Use the compound interest formula to solve real-life problems
Subtopic 2.3 - Special Exponential Functions	

2.3.3	Identify the domain, range, and the average rate of change
2.3.4	Use the continuous compound interest formula to solve real-life problems
Subtopic 3.1 - Logarithms and Logarithmic Functions	
3.1.1	Identify the logarithm of x with base b denoted by $\log_b x$ as the exponent y that makes the equation $b^y = x$, *where* $b > 0$, $x > 0$, *and* $b \neq 1$
3.1.3	Convert a logarithmic equation to an exponential equation and vice versa • Find a variable in terms of another in a real-life context
3.1.8	Analyze the graph of a logarithmic function by describing its domain, range, intercepts, asymptotes, end behavior, and where the function is increasing and decreasing
Subtopic 3.2 - Properties of Logarithms	
3.2.1	Recognize the product property of logarithms that states: For any real numbers a, m and b, where $b \neq 1$: $\log_b mn = \log_b m + \log_b n$
3.2.2	Recognize the quotient property of logarithms that states: For any real numbers a, m and b, where $b \neq 1$: $\log_b \frac{m}{n} = \log_b m - \log_b n$
3.2.3	Recognize the power property of logarithms that states: For any real numbers a, m and b, where $b \neq 1$: $\log_b m^n = n \log_b m$
3.2.4	Solve logarithmic equations by using definition or by using properties of equality
3.2.5	Use properties of logarithms to expand and condense logarithmic expressions
3.2.6	Use values of given logarithms and properties of logarithms to approximate logarithmic expressions
Subtopic 3.3 - Common Logarithms	
3.3.3	Solve exponential equations and inequalities by using logarithms
3.3.4	Recognize the change of base property of logarithms that states: For any real numbers a,b and c,where $b \neq 1$ and $c \neq 1$: $\log_b m = \frac{\log_c m}{\log_c b}$

3.3.6	Use change of base formula to rewrite an equation or an equality using common logarithms and solve it
Subtopic 3.4 - Natural Logarithms	
3.4.1	Identify natural logarithms as logarithms with base e which can be expressed as $\log_e x$ or simply $\ln x$ $(x > 0)$
3.4.2	Convert a logarithmic equation to an exponential equation and vice versa
Subtopic 4.1 - Multiplying and Dividing Rational Expressions	
4.1.1	PR: Recall factoring techniques
4.1.2	Determine the undefined values (excluded values, values outside the domain) of a rational expression
4.1.3	Simplify a rational expression where the numerator and denominator are made of monomials
4.1.4	Simplify a rational expression where the numerator and/or the denominator are polynomials
4.1.5	Find the product or quotient of two rational expressions where the numerator and the denominator are either monomials or polynomials
4.2 **Subtopic: Adding and Subtracting Rational Expressions**	
4.2.5	Solve geometric applications that involves performing operations in rational expressions such as perimeter, area, and volume
Subtopic 4.3 - Graphing Reciprocal Functions	
4.3.2	Determine under what conditions is a reciprocal function undefined (find excluded values
4.3.5	Identify the domain, range, asymptotes, and intercepts for a given reciprocal function. (**Note: y-intercept happens at x=0 and x intercepts happens at y=0**)
Subtopic 4.4 - Graphing Rational Functions	

4.4.4	Find the domain, range, x and y intercepts of a rational function given its graph or its equation
4.4.5	Demonstrate the ability to correctly identify and differentiate between vertical asymptotes and holes in a given rational function $(f)=\frac{(x)(x-c)^m}{q(x)(x-c)^n}$ ' $such\ that\ p(c) \neq 0, q(c) \neq 0, m \geq 0, and\ n \geq 1$, then: • If $m \geq n$, then f has a hole at $x = c$ • If $m < n$, then f has vertical asymptote at $x = c$ • Determine holes and vertical asymptotes given either the equation or the graph of the equation • Realize that a function might have multiple holes and asymptotes
4.4.6	Demonstrate the ability to correctly identify horizontal asymptotes in a given rational function (f). • If f has a higher polynomial degree in the numerator than that in the denominator, then f has no horizontal asymptote but rather may have an oblique asymptote • If f has a lower polynomial degree in the numerator than that in the denominator, then f has a horizontal asymptote of the equation **y=0** • If the degree of the numerator is equal to the degree of its denominator, then f has a horizontal asymptote of equation y= c, where c is the ratio of the leading coefficients of the numerator and the denominator.
4.4.9	Solve real-life applications

The Exam is not limited to the Focused IPQs questions

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Term 1 Focused Informal Practice Questions (Term 1 Focused IPQs)

MAT61
Grade11 | Advanced

1.1.1	Find sums, differences, products, and quotients of functions
1.1.3	Compose functions that are defined in terms of variable or in a set notation

Q1) Given $f(x) = 6x^3 - 4x^2 + 5x - 3$ and $g(x) = 2x^2 - 3x - 5$, find $(f + g)(x)$.

Q2) $f(x) = 10x^3 - 5x^2 + 6x - 7$, $g(x) = 3x^2 - 2x - 4$. Find $(f + g)(x)$

Q3) f$(x) = 3x^3 - 2x^2 - 8$, $g(x) = -4x^3 + 6x^2 - 5x$. Find $(f - g)(x)$

Q4) $f(x) = 8x^3 - 6x^2 + 9x - 5$, $g(x) = 4x^2 - 5x - 7$. Find $(f + g)(x)$

Q5) $f(x) = 4x^3 - 3x^2 - 9$, $g(x) = -6x^3 + 5x^2 - 7x$. Find $(f - g)(x)$

The Exam is not limited to the Focused IPQs questions

Q6) $f = \{(1,2),(2,3),(3,4),\}, g = \{(1,3),(2,4),(3,5)(4,6)\}$

Find (g∘f)(x).

Q7) $f(x) = 5x, g(x) = 2x$. Find (f∘g)(x)

Q8) $f(x) = 6x, g(x) = 3x$. Find (f∘g)(x)

Q9) $f(x) = -x^2 + 9, g(x) = -3x. Find\ (f \circ g)(x)$

Q10) $f(x) = x^2 + 10, g(x) = 6x$. **Find** $(f \circ g)(x)$

$Q11)\ f(x) = 2x^2 + 3x - 4\ and\ g(x) = x^2 - 2x + 5, find\ (f + g)(x)$

A. $3x^2+x+1$
B. x^2+5x+9
C. $3x^2+5x+1$
D. $2x^2-x-1$

Q12) $f(x) = 3x^3 - x^2 + 2x, g(x) = x^3 - 2x^2 - 3x \rightarrow Find\ (f - g)(x).$

A. $2x^3 + x^2 + 5x$
B. $4x^3 - x^2 - x$
C. $2x^3 + x^2 - 5x$
D. $3x^3 - 3x^2 + 3x$

Q13) $f(x) = -x^2 + 4, g(x) = -2x \rightarrow Find\ (f \circ g)(x).$

A. $-4x^2 + 4$
B. $4x^2 - 4$
C. $-x^2 - 4$
D. $4 - x^2$

The Exam is not limited to the Focused IPQs questions

Q14) $f(x) = x^2 - 1, g(x) = x - 3 \rightarrow$ Find $(\frac{f}{g})(x)$.

A. $\frac{x^2-1}{x-3}$
B. $\frac{x^2-1}{x+1}$
C. $\frac{x-1}{x+3}$
D. $\frac{x+1}{x-3}$

1.2.6	Find the equation of the inverse of a linear function

Q15) If $f(x) = 2x + 7$, which is $f^{-1}(x)$?

A. $\frac{x-7}{2}$
B. $2x - 7$
C. $\frac{x+7}{2}$
D. $\frac{-x}{2} + 7$

Q16) $f(x) = 0.5x + 8$, find $f^{-1}(x)$?

A. $x - 16$
B. $2x - 5$
C. $2(x - 8)$
D. $\frac{x-8}{0.5}$

1.3.1	Identify the nth root of a real number
1.3.2	Demonstrate an understanding of the components of a radical expression by recognizing the index, radical sign and the radicand
1.3.5	Find and simplify roots (Use absolute value when needed)
1.3.7	Realize that for any nonzero number b, and any integers x and y with y>1, $\sqrt[y]{b^x} = \sqrt{b^x}^y = (\sqrt{b}^y)^x$ except when b <0 and y is even. When b<0 and y is even, then a complex root may exist

The Exam is not limited to the Focused IPQs questions

1.3.8	Express a radical expression (numerical and algebraic) in its exponential form and vice versa
1.3.10	1.3.10 Simplify expressions with rational exponents
1.3.11	Simplify radical expressions

Q17) Which expression is equivalent to $x^{\frac{5}{6}}$

A. $\sqrt[6]{x^5}$
B. $\sqrt[5]{x^6}$
C. $\sqrt{x^5}$
D. $\sqrt[3]{x^2}$

Q18) Simplify:

$$\sqrt{81x^{10}y^4}$$

A. $9|x^5|y^2$
B. $3x^5y^2$
C. $9x^{10}y^4$
D. $3x^2y^2$

Q19) Simplify:

$$x^{\frac{2}{3}} \times x^{\frac{4}{3}} =$$

Q20) Write $(x^{10})^{\frac{3}{5}}$ in radical form.

The Exam is not limited to the Focused IPQs questions

Q21) Express $\sqrt[4]{x^3}$ in exponential form.

Q22) Simplify:

$$\sqrt[4]{\frac{256x^8y^{12}}{16}} =$$

Q23) Simplify: $y^{-\frac{3}{2}}$

Q24) Simplify:

$$\sqrt[3]{\frac{27x^9y^6}{8}} =$$

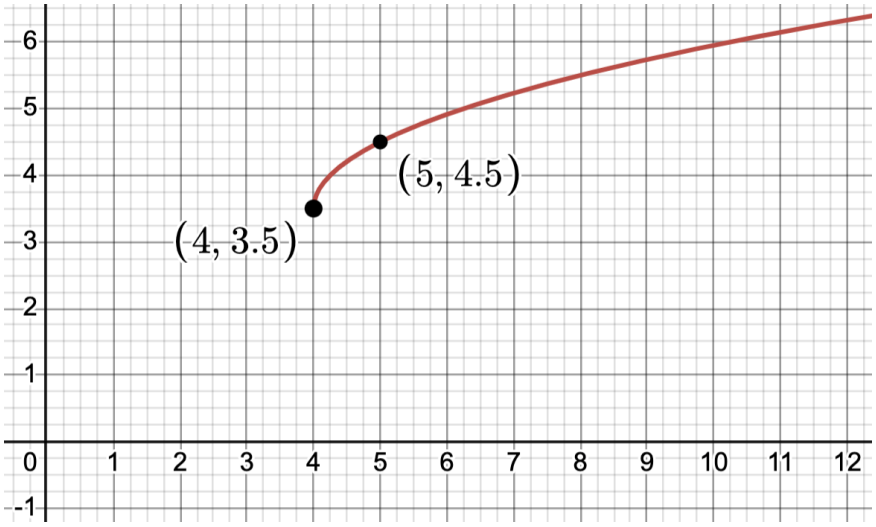
Subtopic 1.4 - Graphing Radical Functions	
1.4.1	Recognize that a square root function is a type of radical functions.
1.4.3	Analyze a square root function by finding its domain, range, intercepts, end behavior, intervals where its increasing or decreasing, intervals where its positive or negative, min or max, and test it symmetry
1.4.4	Write the equation of a square root function given its graph

The Exam is not limited to the Focused IPQs questions

1.5.9	Recognize that "two irrational expressions are said to be conjugate if their product is a rational expression
1.5.10	Use rationalizing to simplify algebraic and numerical radical expressions

1

Q25) Write the eqauation of the graph of $g(x)$, which passes through (4, 3.5) and (5,4.5), as shown below.



Q26) For $g(x) = \sqrt{x-2} + 3$, Find the domain and range

1.5.2	Use the product property of radicals to multiply monomials involving radicals
1.5.6	Multiply monomials involving radicals
1.5.7	Use the distributive property to multiply numerical and algebraic radical expressions

The Exam is not limited to the Focused IPQs questions

Q27) **Simplify:**

$i)\sqrt{6}\left(\sqrt{2}+\sqrt{3}\right)=$

ii) $4\sqrt{12}+\sqrt{32}-2\sqrt{50}+\sqrt{8}=$

iv)$2\sqrt[4]{16x^4y^8}\times 5\sqrt[4]{4x^2y^4}$

v)$\sqrt{\frac{x^3}{y^6}}$

vi) $(6\sqrt{3}+5\sqrt{2})\left(2\sqrt{6}+3\sqrt{8}\right)=$

vii) $3\sqrt{24x}-2\sqrt{54x}+\sqrt{48}=$

1.6.1	Solve radical equations (square root) in one variable and identify extraneous solutions
1.6.2	Solve radical equations (nth root) in one variable and identify extraneous solutions

1. Solve $\sqrt{x-4}=6$. Check.

2. The trunk length model $\ell=18\sqrt[3]{t}+15$. If $\ell=81$, find t.

3. Solve $3+\sqrt{2x+5}=10$.

The Exam is not limited to the Focused IPQs questions

4. Solve $\sqrt[3]{4x-20}-2=0$.

5. Solve $\sqrt{x-12}=4-\sqrt{x}$. Check extraneous.

6. Solve $3(2n-1)^{\frac{1}{3}}-2=0$.

2.1.1	Identify the exponential function and distinguish between growth and decay functions • Determine whether a given function represents an exponential growth or decay
2.1.3	Identify the domain, range, intercepts, asymptotes, and end behavior for an exponential function

Q29) Given f(x)=$4(1.6)^x$. Determine whether it is growth or decay,domain,range,yintercepts and asymptotes.

Q30) Given $g(x)=2(0.7)^{x+2}$. Determine whether it is growth or decay,domain,range,yintercepts and asymptotes.

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Q31) Given $g(x) = -5(2)^{x-1} + 3$. Determine whether it is growth or decay,domain,range , yintercepts and asymptotes.

2.2.1	Solve exponential equations algebraically
2.2.3	Use the compound interest formula to solve real-life problems
2.2.4	Write an exponential function knowing that its graph passes through two given points
Subtopic 2.3 - Special Exponential Functions	
2.3.3	Identify the domain, range, and the average rate of change
2.3.4	Use the continuous compound interest formula to solve real-life problems

Q32) Solve $2^{x+2} = 4^{x-1}$.

Q33) Solve $9^{x+1} = 27^{x-2}$.

Q34) The graph of an **exponential function** passes through the points (0,2)and (1,4). Write the exponential function in the form $f(x) = a \cdot b^x$.

The Exam is not limited to the Focused IPQs questions

Q35) The graph of an **exponential function** passes through the points The points (0,3)and (2,12)lie on $f(x)$. Write the exponential function in the form $f(x) = a \cdot b^x$.

Q36) The temperature of a cooling object is 90°at $t = 0$ min and 45°after 10 min.
Write the exponential decay model $T(t) = a \cdot b^t$.

Q37) Ali invests \$2 000 at 4 % interest compounded annually for 5 years. Find the amount in the account.

Q38) An amount of \$6 000 is deposited in a bank account earning 4.8 % interest compounded monthly. Find the value after 10 years.

Q39) An amount of \$8 000 is invested at 5 % interest compounded monthly. How long will it take to reach \$10 000?

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Q40) The population of a bacteria culture is modeled by $P(t) = 500e^{0.07t}$.
Find the population after 10 hours.

Q41) $600 is invested at 2.5% annual interest, compounded continuously. Find the balance after 8 years.

Q42) An initial investment of $400 grows continuously at an annual rate of 3%. Find the amount after 5 years.

A

Q43). Consider the function $y = e^{x+2} + 1$. What is the range of the function?

A. $y > 1$
B. $y > 0$
C. $y < 1$
D. $y > -2$

Q44)Find the average rate of change of $f(x) = -2e^{x-1} + 5$over the interval [0,2].

A. 0.85
B. –1.92
C. 2.15
D. -2.3504

The Exam is not limited to the Focused IPQs questions

Q45) Find the average rate of change of $f(x) = -5e^{x-4} + 7$over the interval [1,4].
A. 0.27
B. –3.05
C. 1.21
D. -1.583

3.1.1	Identify the logarithm of $\boldsymbol{x}$ with base $\boldsymbol{b}$ denoted by $\boldsymbol{\log_b x}$ as the exponent y that makes the equation $\boldsymbol{by = x}$, $\boldsymbol{where\ b > 0}$, $\boldsymbol{x > 0}$, $\boldsymbol{and\ b \neq 1}$
3.1.3	Convert a logarithmic equation to an exponential equation and vice versa • Find a variable in terms of another in a real-life context
3.1.8	Analyze the graph of a logarithmic function by describing its domain, range, intercepts, asymptotes, end behavior, and where the function is increasing and decreasing

Q46) Which equation shows $\log_4 64 = 3$in exponential form?

A. $4^3=64$
B. $3^4 = 64$
C. $4^6=3$
D. $3^6=4$

Q47) Evaluate $\log_5 25$.

A. 1
B. 2
C. 3
D. 5

Q48) Rewrite $2^x = 8$in logarithmic form.

A. $log_8 2 = x$
B. $log_2 8 = x$
C. $log_x 8 = 2$
D. $log_8 x = 2$

The Exam is not limited to the Focused IPQs questions

Q49) Which of the following represents exponential decay?

A. $3.(2)^x$
B. $5.(0.8)^x$
C. $2x + 5$
D. $(x - 3)^2$

Q50) Find the domain of $f(x) = \log_2(x - 4)$.

A. $x > 4$
B. $x < 4$
C. $x \geq 0$
D. All real numbers

Q51) Compared to the graph of $y = \log_2(x)$, which graph represents $y = \log_2(x + 3)$?

A. Shifted right 3 units
B. Shifted left 3 units
C. Shifted up 3 units
D. Shifted down 3 units

Q52) Write $7^2 = 49$in logarithmic form.

Q53) Convert $9^x = 81$into logarithmic form.

Q54) f $f(x) = -2\log_5(x + 2) + 1$, find:

- **Domain:**
- **Range:**
- **Vertical Asymptote:**
- **End Behavior:** f

3.2.1	Recognize the product property of logarithms that states: For any real numbers ***a***, ***m*** **and** ***b***, **where b ≠ 1 :** $\log_b mn = \log_b m + \log_b n$

The Exam is not limited to the Focused IPQs questions

3.2.2	Recognize the quotient property of logarithms that states: For any real numbers ***a***, ***m*** **and** ***b***, **where b ≠ 1 :** $\log_b m = \log_b m - \log_b n$
3.2.3	Recognize the power property of logarithms that states: For any real numbers ***a***, ***m*** **and** ***b***, **where b ≠ 1 :** $\log_b mn = n \log_b m$
3.2.4	Solve logarithmic equations by using definition or by using properties of equality
3.2.5	Use properties of logarithms to expand and condense logarithmic expressions
3.2.6	Use values of given logarithms and properties of logarithms to approximate logarithmic expressions

Q55) Solve $\log_5 x = 2$.

Q56) Solve $\log_3 x = \frac{5}{2}$.

Q57) Expand $\log_4(16y)$.

Q58) Condense $\log_2 a + 3\log_2 b$.

Q59) Solve $\log_2(3x + 1) = \log_2(x + 9)$.

Q60) Use properties to expand $\log_3(\frac{27p^4}{q})$.

The Exam is not limited to the Focused IPQs questions

Q61) Solve $\log_8(2x-4)=\frac{2}{3}$.

Q62) Simplify $2\log_5 x-\frac{1}{2}\log_5 y$.

Q63) The graph of $f(x)=\log_3(x-4)+2$has a vertical asymptote at

A. $x=-4$
B. $x=4$
C. $x=-2$
D. $x=2$

Q64) Which property is used in $\log_b(MN)=\log_b M+\log_b N$?

A. Power property
B. Product property
C. Quotient property
D. Change of base property

Q65)Use $log_a 6=x$, $log_a 5=y$ and the propertoes og logarithms to find $log_a(150a^3)$ in terms of x and y

The Exam is not limited to the Focused IPQs questions

3.3.3	Solve exponential equations and inequalities by using logarithms
3.3.4	Recognize the change of base property of logarithms that states: For any real numbers ***a*,*b* and c,where *b* ≠ 1 and c ≠ 1 : log*bm* = log*cm* / log*c*b**
3.3.6	Use change of base formula to rewrite an equation or an equality using common logarithms and solve it

Q66) Which equation could be used to solve $5^x = 42$??

A. $x = \frac{42}{5}$
B. $x = \frac{log42}{log5}$
C. $x = 42^{\frac{1}{2}}$
D. $x = \log 42 - \log 5$

Q67) Solve $6^{2x} = 180$.

A. 1.449
B. 2.0345
C. 1.4322
D. 0.6827

Q68) Which equation is equivalent to $12 = -3 + 5\log_9 x$?

A. $\frac{logx}{log9} = \frac{3}{5}$
B. $x = 9^3$
C. $\frac{log9}{logx} = \frac{15}{12}$
D. $\frac{logx}{log9} = \frac{15}{12}$

Q69) Which equation could be used to solve $7^x = 120$?

A. $x = \frac{120}{7}$
B. $x = \frac{log120}{log7}$
C. $x = 120^{\frac{1}{7}}$

D. $x = log120 - log7$

Q70) Solve $9^{x-3} = 5^x$

Q71) Solve $5^{3x} = 190$.

3.4.1	Identify natural logarithms as logarithms with base ***e*** which can be expressed as **log*e* *x*** or simply **ln*x*** (***x*** > **0**)
3.4.2	Convert a logarithmic equation to an exponential equation and vice versa

Q72) Match each equation to an equivalent equation.

$e^7 = 9x$____
$e^9 = 7x$____
$e^{7x} = 9$____
$e^{9x} = 7$____

A. $\ln\ 9 = 7x$
B. $\ln\ 7 = 9x$
C. $\ln\ 9x = 7$
D. $\ln\ 7x = 9$

Q73) Which shows $\frac{1}{2}\ln\ 36 - \ln\ 6 + \ln\ 10$as a single logarithm?

A. $ln10$
B. $ln30$

C. ln60

D. $ln100$

Q74) Determine if each statement is true or false.

a. $(\ln\ a)^2 = 2\ln\ a \rightarrow$

b. $-\ln\frac{1}{x} = \ln\ x \rightarrow$

c. $\frac{\ln x}{\ln y} = \ln\ (x/y) \rightarrow$

d. $\ln\ e^{2x} = 2x \rightarrow$

Q75) A deposit of AED 6000 grows continuously at 3%.

Find the balance after 5 years.

$$A = 6000e^{0.03(5)} = 6000e^{0.15} \approx 6969.3$$

Q76) Write $\ln\ x = 1.204$ in exponential form.

Q77) Write $e^5 = x$ in logarithmic form.

Q78) Solve $\ln\ (x + 2) = 4$.

Q79) Expand $\ln\frac{4y+3}{2\sqrt[3]{y}}$

Q80) Condense $\ln\ (2x + 5) - 3\ln\ x - \ln\ (x - 1)$.

4.1.1	PR: Recall factoring techniques
4.1.2	Determine the undefined values (excluded values, values outside the domain) of a rational expression
4.1.3	Simplify a rational expression where the numerator and denominator are made of monomials
4.1.4	Simplify a rational expression where the numerator and/or the denominator are polynomials
4.1.5	Find the product or quotient of two rational expressions where the numerator and the denominator are either monomials or polynomials

Q81) Simplify $\frac{x^2+6x}{x^2+8x+12}$

A. $\frac{x}{x+4}$
B. $\frac{x}{x+2}$
C. $\frac{1}{x+6}$
D. $\frac{x}{x+3}$

Q82) Simplify $\frac{x^2-2x}{x-4} \times \frac{x-4}{x-1}$

A. $\frac{x(X+4)}{x-4}$
B. $\frac{x(x-2)}{x-1}$
C. $\frac{x(x+4)}{x-1}$
D. $\frac{x(x-2)}{x-4}$

Q83) Simplify $\frac{x^2}{y^3} \div \frac{3y}{x}$

A. $\frac{x^3}{3y^4}$
B. $\frac{3y^2}{x^2}$

C. $\frac{x^3}{y^4}$

D. $\frac{x^3}{3y^2}$

Q84) Simplify $\frac{x^2-5x-14}{x^2-49}$

A. $\frac{x+2}{x+7}$

B. $\frac{x-2}{x+7}$

C. $\frac{x-5}{x+7}$

D. $\frac{x+5}{x-7}$

Q85) For which value of $x$is $\frac{x+2}{x-6}$undefined? Find the domain.

Undefined when $x - 6 = 0 \Rightarrow x = 6$

Domain: $x \in \mathbb{R}, x \neq 6$

Q86) Simplify $\frac{x^2+7x}{x-5} \div \frac{x^2+6x-7}{x^2-25}$

Q87) Simplify $(\frac{3a^2b^3}{5a^5b}) \times (\frac{25b^2}{9a^{-3}b^4})$

Q88) Simplify $\frac{45a^5b^2}{28} \cdot \frac{14b^4}{15a^7}$

4.2.5	Solve geometric applications that involves performing operations in rational expressions such as perimeter, area, and volume

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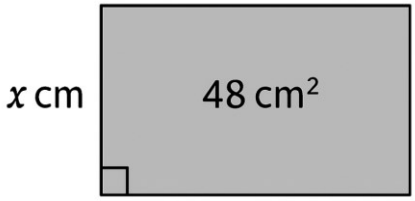
Q89) The rectangle below has area 48 cm^2. One side is $x$cm.Write an expression for the **perimeter** in

terms of x.



Q90) A **rectangular tank** has a **volume of 120 cm^3** and a **length of x cm**.
If the width is **(x – 3)** cm, write an expression for the **height** in terms of x.

4.3.2	Determine under what conditions is a reciprocal function undefined (find excluded values
4.3.5	Identify the domain, range, asymptotes, and intercepts for a given reciprocal function. (Note: y-intercept happens at x=0 and x intercepts happens at y=0)
4.4.4	Find the domain, range, x and y intercepts of a rational function given its graph or its equation
4.4.5	Demonstrate the ability to correctly identify and differentiate between vertical asymptotes and holes in a given rational function $(f)=\frac{(x)(x-c)^m}{q(x)(x-c)^n}$ ' *such that* $p(c) \neq 0$, $q(c) \neq 0$, $m \geq 0$, *and* $n \geq 1$, then: • If $m \geq n$, then f has a hole at $x = c$ • If $m < n$, then f has vertical asymptote at $x = c$

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	• Determine holes and vertical asymptotes given either the equation or the graph of the equation • Realize that a function might have multiple holes and asymptotes
4.4.6	Demonstrate the ability to correctly identify horizontal asymptotes in a given rational function (f). • If f has a higher polynomial degree in the numerator than that in the denominator, then f has no horizontal asymptote but rather may have an oblique asymptote • If f has a lower polynomial degree in the numerator than that in the denominator, then f has a horizontal asymptote of the equation **y=0** • If the degree of the numerator is equal to the degree of its denominator, then f has a horizontal asymptote of equation y= c, where c is the ratio of the leading coefficients of the numerator and the denominator.
4.4.9	Solve real-life applications

Q91) For $f(x) = \frac{3}{x-2} + 1$

i. Domain = _____

ii. Range = _____

iii. Vertical asymptote = _____

iv. Horizontal asymptote = _____

v. x–intercept(s) = _____

vi. y–intercept = _____

i

Q92) For $g(x) = -\frac{2}{x+4} - 3$state the domain and range.

Domain: $x \neq -4$. Range: $y \neq -3$.

Q94) For $k(x) = \frac{2x-8}{x+1}$

i. Horizontal asymptote = _____

ii. Vertical asymptote = _____

iii. x–intercept(s) = _____

Q95) Let $m(x) = \frac{x^2-9}{x^2-4x-12}$.
i. Factor and simplify $m(x)$.
ii. List all values **excluded** from the domain.
iii. State any vertical and horizontal asymptotes of the simplified function.

i.

Q96)Which of the following represents the vertical asymptote for the function below?

$$f(x) = \frac{8x-4}{10x-20}$$

A. $x = -2$
B. $x = 0$
C. $x = 2$
D. $x = 2$

Q70)Use the function $f(x) = \frac{x-3}{-3x+9}$to answer the below:

i. State the points of discontinuity:

ii. **Domain:**

ii. Identify the horizontal and vertical asymptotes:

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Q71)Use the function $f(x) = \frac{4x^2+12x+8}{x^2+4x+3}$to answer the below:

i.Points of discontinuity:

ii. Domain:

iii. Horizontal Asymptote:

iv. Vertical Asymptote:

Q72) Identify the features of the graph of $f(x) = \frac{x^3-27}{x^2-9}$.
Select **all** that apply.

A. There is a hole at $x = 3$.
B. There is a vertical asymptote at $x = -3$.
C. There is an oblique asymptote at $y = x$.
D. There is a horizontal asymptote at $y = 1$.
E. There is a zero at $x = 3$.

Q73)Identify the features of the graph of $f(x) = \frac{x^3-8}{x^2-4}$.
Select **all** that apply.

A. There is a hole at $x = 2$.
B. There is a vertical asymptote at $x = -2$.
C. There is an oblique asymptote at $y = x$.
D. There is a horizontal asymptote at $y = 2$.
E. There is a zero at $x = 2$.

Q74)A factory makes custom phone cases. The average cost per case (in dollars) when producing $x$cases in a day is modeled by

$$A(x) = \frac{12000}{x} + 35, x > 0.$$

Questions

The Exam is not limited to the Focused IPQs questions

1. State the **domain**.

2. Identify the **vertical** and **horizontal** asymptotes.

3. Find how many cases must be produced so that the **average cost is $50**.

4. For what production levels is the **average cost** $\leq$ \$45?

6. Does the graph have an x**-intercept** or y**-intercept**? Explain.

6. If the plant's maximum capacity is 5000cases/day, what is the **lowest achievable average cost** at that capacity?