



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

**NASIONALE
SENIOR SERTIFIKAAT**

GRAAD 12

WISKUNDE V1

SEPTEMBER 2017

PUNTE: 150

TYD: 3 URE

Hierdie vraestel bestaan uit 9 bladsye en 'n Inligtingsblad

Kopiereg voorbehou

Blaai asseblief om

VRAAG 11.1 Los op vir x :

1.1.1. $x^2 = 8x$ (3)

1.1.2. $4x^2 - 4x - 4 = 0$ (korrek tot twee desimale syfers) (3)

1.1.3. $(2-x)(x+4) \leq 0$ (3)

1.1.4. $2 \cdot 3^{x+1} - 3 \cdot 3^{x-1} = 104$ (4)

1.2 Indien $\sqrt{10} = 3,162$, bereken, sonder hulp van 'n sakrekenaar, die waarde van $\sqrt[5]{316,2}$. (4)1.3 Los op vir x en y gelyktydig:

$x = y + 1$ and $0 = (2x - y)(x + 2y - 3)$ (6)

[23]

VRAAG 22.1 Gegee die kwadratiese ry : 6 ; x ; 26 ; 45 ; y 2.1.1 Skryf die eerste vier eerste verskille neer, in terme van x en y , indien nodig. (2)2.1.2 Vervolgens, bepaal die waardes van x en y . (4)2.2 Bereken die waarde van n , indien: $\sum_{k=1}^n (4 - 3k) = -125$ (5)

[11]

VRAAG 3Die n -de term van 'n meetkundige reeks is $T_n = x(x+1)^{n-1}$ 3.1 Bereken die konstante verhouding van die reeks, in terme van x in die eenvoudigste vorm. (2)3.2 Bereken die waarde van x waarvoor die reeks konvergeer. (3)3.3 Bereken $\sum_{n=1}^{\infty} x(x+1)^{n-1}$ indien die reeks konvergeer. (3)3.4 As $x = 1$ gegee is, skryf die eerste drie terme van die meetkundige reeks neer. (2)

3.5 Bereken die som van die eerste 25 terme van die reeks in Vraag 3.4. (3)

[13]

VRAAG 5

Gegee: $f(x) = \frac{-3}{x+1} + 5$

- 5.1 Skryf neer die
- 5.1.1 asimptote van f (2)
- 5.1.2 definisieversameling van f . (2)
- 5.2 Bereken die afsnitte met die asse van die grafiek van f . (4)
- 5.3 Skets die grafiek van f , vir $x > -1$, toon duidelik die asimptote en die afsnitte met die asse aan. (3)
- 5.4 Die grafiek van f word geskuif met 3 eenhede na regs en dan gereflekteer oor die x -as om die grafiek van h te vorm. Skryf die vergelyking van h neer.
(Die beperkings gestel in VRAAG 5.3 is nie van toepassing op hierdie vraag nie) (3)
- [14]**

VRAAG 6

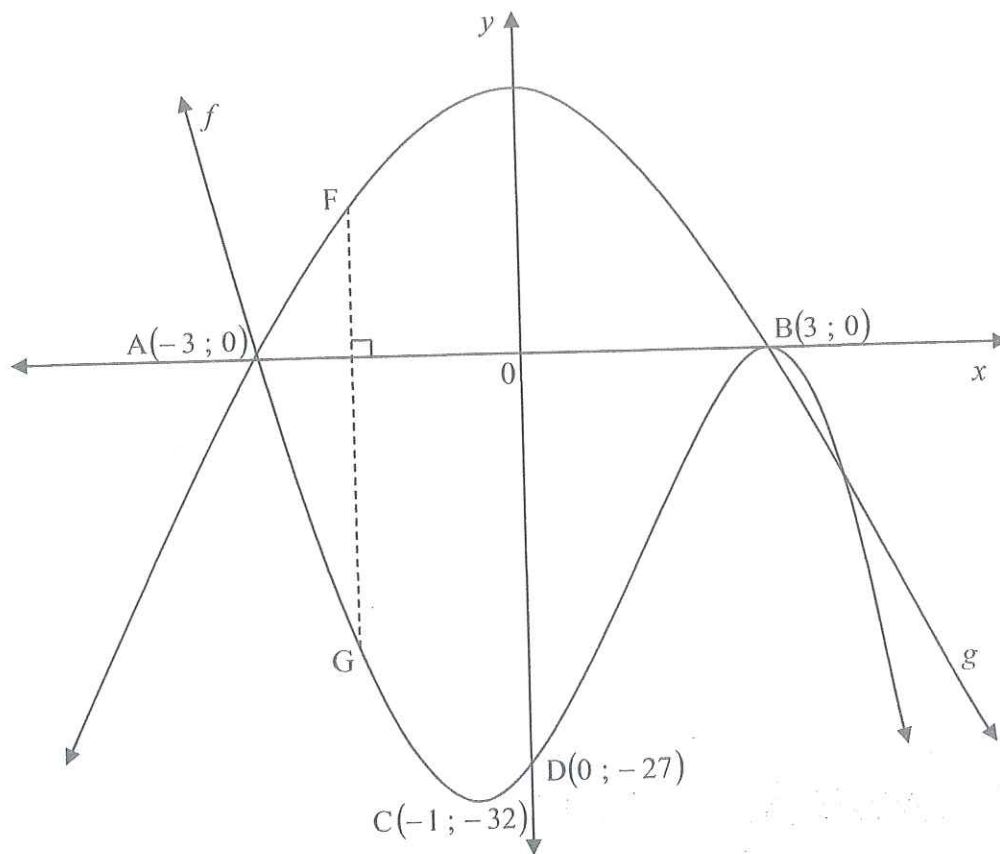
- 6.1 Lees die advertensie noukeurig. Die onderstaande vraag het betrekking op die advertensie.



- Jy besluit om R1 000 in die rekening soos hierbo geadverteer te belê.
Hoeveel maande sal dit neem om die belegging te verdubbel? (4)

VRAAG 8

Gegee die grafieke van $f(x) = -x^3 + 3x^2 + 9x - 27$ en $g(x) = -x^2 + 9$. A(-3;0) en B(3;0) is die x -afsnitte van beide f en g . C(-1;-32) en D(0;-27) is die lokale minimum en y -afsnit van f respektiewelik.



8.1 Gebruik die gegewe grafieke om die x -waardes vir elk van die volgende gevalle te bepaal.

8.1.1 $f(x)$ is 'n streng stygende funksie. (2)

8.1.2 $f(x) \cdot g(x) < 0$ (2)

8.1.3 $f'(x)$ en $g(x)$ is albei negatief. (2)

8.2 Bepaal die vergelyking van die raaklyn aan f by die punt van infleksie in die vorm $y = mx + c$ (7)

8.3 Vir watter waardes van x sal die grafiek van f konkaf af wees? (2)

8.4 Indien FG 'n lyn loodreg op die x -as is tussen A en B, waar F en G punte op g en f respektiewelik is. Bereken die waarde van x (korrek tot twee desimale plekke) vir maksimum lengte van FG . (5)

[20]

NNNNENTD

VRAAG 10

10.1 Peter speel hokkie en sokker by die skool. Hy het 'n 40% kans om vir die hokkiespan gekies te word en 60% kans om vir die sokkerspan gekies te word en 'n 30% kans om vir albei spanne gekies te word.

Bereken die waarskynlikheid dat Peter vir die hokkie - of vir die sokkerspan gekies sal word.

(3)

10.2 Tydens 'n opname is 60 mense gevra met watter hand hulle skryf en wat die kleur van hul hare is. Die resultaat is in die tabel hieronder opgesom.

		HAND WAARMEE GESKRYF WORD		
		Regs	Links	Totaal
HAARKLEUR	Lig	a	b	20
	Donker	c	d	40
	Totaal	48	12	60

Die opname het getoon dat “die hand waarmee geskryf word” en “die haarkleur” onafhanklike gebeurtenisse is.

Bepaal die waardes van $a, b, \text{ en } c$.

(5)

[8]

VRAAG 11

11.1 Die syfers 0 tot 9 word gebruik om kodes te vorm.

11.1.1 Bepaal die aantal verskillende 6-syfers kodes wat gevorm kan word indien herhaling van syfers toegelaat word (1)

11.1.2 Bepaal die waarskynlikheid van verskillende 6-syfer kodes, wat gevorm kan word indien dit met 'n 9 begin en met 'n 2 eindig, indien die herhaling van syfers nie toegelaat word nie (3)

11.2 Die syfers 0 tot 9 word gebruik om 10-syfer kodes te vorm.

Bepaal die aantal moontlike 10-syfer kodes wat gevorm kan word as die 2 en die 3 nie langs mekaar mag voorkom nie en as herhaling van syfers nie toegelaat word nie. (4)

[8]

TOTAAL: 150



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICS P1

SEPTEMBER 2017

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages and 1 Information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, etc. that you have used to determine your answers.
4. Answer only will not necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. Write neatly and legibly.
10. Use black or blue pen only.

QUESTION 11.1 Solve for x :

1.1.1. $x^2 = 8x$ (3)

1.1.2. $4x^2 - 4x - 4 = 0$ (correct to two decimal places) (3)

1.1.3. $(2-x)(x+4) \leq 0$ (3)

1.1.4. $2 \cdot 3^{x+1} - 3 \cdot 3^{x-1} = 104$ (4)

1.2 If $\sqrt{10} = 3,162$, calculate without the use of a calculator, the value of $\sqrt[5]{316,2}$ (4)

1.3 Solve for x and y simultaneously:

$$x = y + 1 \text{ and } 0 = (2x - 1)(x + 2y - 3)$$
 (6)

[23]**QUESTION 2**2.1 Given the quadratic sequence : 6 ; x ; 26 ; 45 ; y

2.1.1 Determine the first four first differences in terms of x and y (2)

2.1.2 Calculate the values of x and y . (4)

2.2 Calculate the value of n , if :

$$\sum_{k=1}^n (4 - 3k) = -125$$
 (5)

[11]**QUESTION 3**3.1 The n -th term of a geometric series is $T_n = x(x+1)^{n-1}$

3.1.1 Determine the constant ratio, in terms of x , in its simplest form. (2)

3.1.2 Determine the values of x so that the series $\sum_{n=1}^{\infty} x(x+1)^{n-1}$ converges. (3)

3.2 Calculate S_{∞} (3)

3.3 If $x = 1$, write down the first three terms of the geometric series (2)

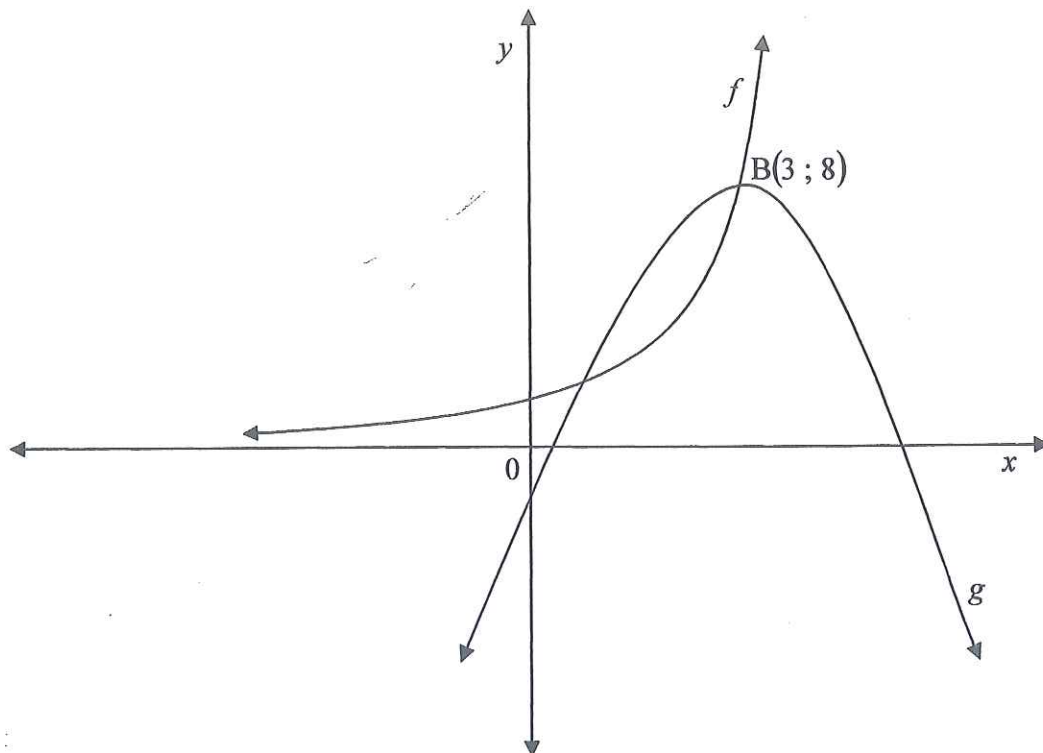
3.4 Determine the sum of the first 25 terms of the series calculated in Question 3.3 (3)

[13]

QUESTION 4

Sketched below are the graphs of $f(x) = 2^x$ and $g(x) = -(x-p)^2 + q$, where q is constant.

$B(3; 8)$ is one of the points of intersection of f and g . B is also the turning point of g .



- 4.1 Determine the equation of g in the form $y = ax^2 + bx + c$ (3)
- 4.2 Determine the range of $g(x) - 2$. (2)
- 4.3 For which values of k will $g(x) - k = 0$, has non-real roots? (2)
- 4.4 Write down the equation of $f^{-1}(x)$ in the form $y = \dots$ (2)
- 4.5 Sketch the graph of f^{-1} . Indicate the x -intercepts and the coordinates of one other point on your graph. (3)
- 4.6 For which values of x will $f^{-1}(x) \leq 3$? (2)
- 4.7 Determine for which values of x will $\frac{f'(x)}{g'(x)} > 0$ (2)

[16]

QUESTION 5

Given: $f(x) = \frac{-3}{x+1} + 5$

5.1 Write down the

5.1.1 asymptotes of f (2)

5.1.2 domain of f (2)

5.2 Calculate the intercepts of the graph of f with the axes. (4)

5.3 Sketch the graph of f , for $x > -1$ in your ANSWER BOOK, clearly showing the asymptotes and the intercepts with the axes. (3)

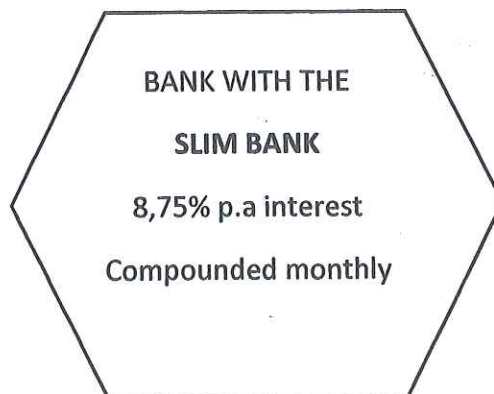
5.4 The graph of f is shifted three units to the right and then reflected about the x -axis to form the graph of h . Write down the equation of h . (3)

(Note that the restrictions in QUESTION 5.4 do not apply to this question).

[14]

QUESTION 6

Read the advertisement carefully. The questions below refer to the advertisement.



6.1 You decide to invest R1 000 into the account as advertised above.
How many months will it take the investment to double? (4)

6.2 John purchased a new car. The bank offered him a loan at an effective interest rate of 16,4% p.a. Determine the nominal interest rate, compounded monthly, that he is required to pay. (3)

6.3 A farmer sets up a sinking fund. He plans to accumulate R2,3 million in the fund at the end of 8 years, at 12% p.a. interest compounded quarterly. Calculate the quarterly payments into the fund if his first payment is made in 3 months' time. (4)

6.4 Samuel plans to attend the 2018 Soccer World Cup in Russia. He wants to book an all-inclusive soccer-package through a travel agency at the price of R135 000. Samuel takes a personal loan from a bank. He has the option of taking out a loan of 14,75% p.a, interest compounded monthly. He then decides to take the loan and chooses to pay it back in 18 equal monthly instalments, starting three months after receiving the loan.

6.4.1 Determine the total amount of the loan when he started repaying it. (2)

6.4.2 Determine his monthly instalment. (4)

[17]

QUESTION 7

7.1 If $f(x) = 5 - 2x^2$, determine $f'(x)$ using FIRST PRINCIPLES. (5)

7.2 Determine:

7.2.1 $D_x \left[x^4 - 2x + \frac{1}{x^2} \right]$ (4)

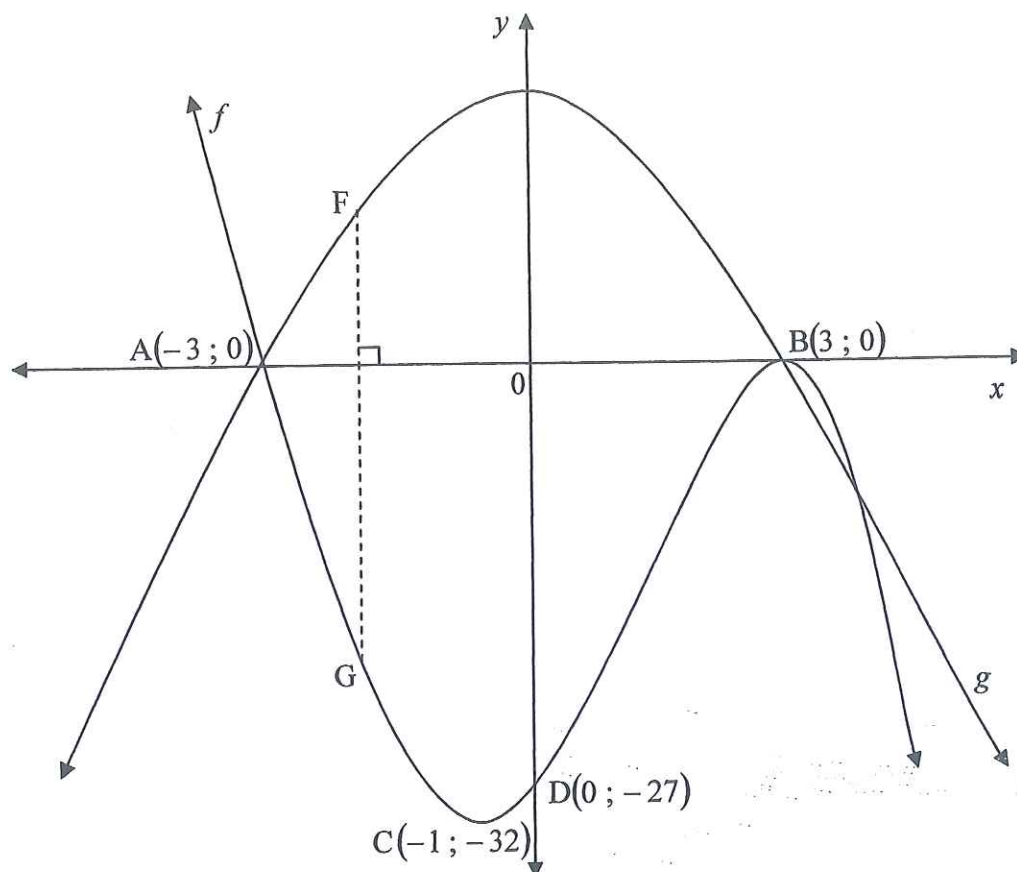
7.2.2 $\frac{dy}{dx}$, if $y = \frac{2x-3}{\sqrt[4]{x}}$ (4)

[13]

QUESTION 8

The graph of $f(x) = -x^3 + 3x^2 + 9x - 27$ and $g(x) = -x^2 + 9$ are sketched below.

$A(-3; 0)$ and $B(3; 0)$ are the x -intercepts of both f and g . $C(-1; -32)$ and $D(0; -27)$ are the local minimum and y -intercept of f respectively.

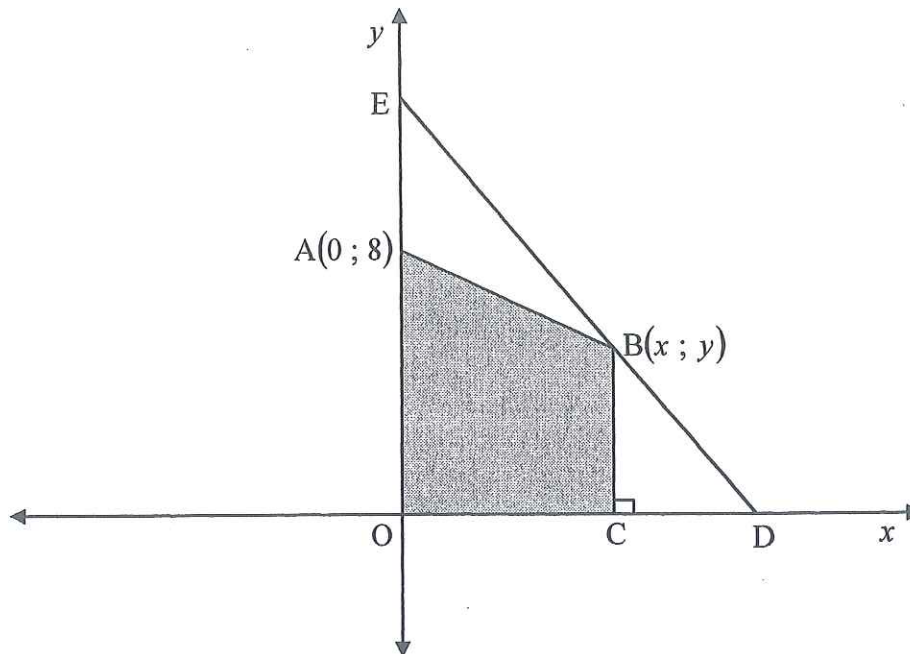


- 8.1 Use the given graphs to determine the values of x for each of the following conditions.
- 8.1.1 f is a strictly increasing function. (2)
- 8.1.2 $f(x), g(x) < 0$ (3)
- 8.1.3 $f'(x)$ and g are both negative (3)
- 8.2 Determine the equation to f at the point of inflection in the form $y = mx + c$ (5)
- 8.3 For which values of x will the graph of f be concave down? (2)
- 8.4 FG is a line perpendicular to the x -axis between A and B , where F and G are points on g and f respectively. Determine the value of x (correct to two decimal places) for maximum length of FG . (5)

[20]

QUESTION 9

The equation of ED is $y + 2x = 10$, where x and y are always positive, as shown below.



$B(x; y)$ is any point on ED. A is the point $(0; 8)$, and BC is perpendicular to the x -axis

9.1 Determine an expression for BC in terms of x . (2)

9.2 Show that the area AOCB $= -x^2 + 9x$ (2)

9.3 Calculate the coordinates of B such that the shaded area AOCB is a maximum. (3)

[7]

QUESTION 10

10.1 Peter plays hockey and soccer at school. He has a 40% chance of being selected for the hockey team and a 60% chance of being selected for the soccer team and a 30% chance of being selected for both teams.

Calculate the probability that Peter will be selected for the hockey or soccer team

(3)

10.2 A survey was conducted asking 60 people with which hand they write and what colour hair they have.

The results are summarized in the table below:

		HAND USED TO WRITE WITH		
		Right	Left	Total
HAIR COLOUR	Light	a	b	20
	Dark	c	d	40
	Total	48	12	60

The survey concluded that the “hand used for writing” and “hair colour” are independent events.

Calculate the values of a , b , and c .

(5)

[8]

QUESTION 11

11.1 The digits 0 to 9 are used to form codes.

11.1.1 Determine the number of unique 6-digits codes that can be formed if repetition of digits is allowed.

(1)

11.1.2 Determine the probability of unique 6-digit codes that can be formed that start with a 9 and end with a 2, if repetition of digits is not allowed.

(3)

11.2 The digits 0 to 9 are used to form 10-digit codes.

Determine the number of unique 10-digit codes that can be formed if the 2 and the 3 may not appear next to each other and repetition of digits is not allowed.

(4)

[8]

TOTAL: 150

INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1 \quad S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

$$F = \frac{x[(1 + i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

In $\triangle ABC$:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2}ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2\sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum x}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$