



CONFERENCE PROCEEDINGS

THE INTERNATIONAL CONFERENCE ON TEACHING MATHEMATICS – NATURAL SCIENCES IN HIGHER EDUCATION INSTITUTIONS 2022

December 10th, 2022

Dong Thap University

783 Pham Huu Lau Street, Ward 6,

Cao Lanh City, Dong Thap Province, Vietnam



<https://sites.google.com/dthu.edu.vn/icon-tmnshei-2022>

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**THE INTERNATIONAL CONFERENCE ON
TEACHING MATHEMATICS AND NATURAL SCIENCES
IN HIGHER EDUCATION INSTITUTIONS**

December 10-11, 2022

Dong Thap University, Vietnam

CONFERENCE SCHEDULE

Plenary Section

Location: Lecture Hall 1

Link online: <https://meet.google.com/yej-azyp-vix>

Time (GMT+7)	Content	Presenter
7h30 – 8h00	Registration	
8h00 – 8h05	Welcoming	
8h05 – 8h15	Opening Speech	Nguyen Van Dung, Dong Thap University
8h15 – 8h40	Physicochemical and Microbiological Attributes of Dried Anchovies (<i>Stolephorus</i> sp.) in the Formation of Histamine along the Supply Chain	Amascual, R. H., Samar State University
8h40 – 9h05	The overview of fixed-point theory and applications with the study courses at Thammasat university	Wutiphol Sintunavarat, Thammasat University
9h05 – 9h20	Tea break and Photo Session	
SECTIONAL PRESENTATIONS		
9h30 – 12h15	Section of Research and Teaching Mathematics	Chairman: Dr. Nguyen Van Dung, Dong Thap University
	Section of Research and Teaching Information Technology	Chairman: Dr. Luong Thai Ngoc, Dong Thap University
	Section of Research and Teaching Natural Sciences	Chairman: Assoc. Prof. Tran Van Tan, Dong Thap University
Lunch time		

Section of Research and Teaching Mathematics

Location: Room 503H2

Link online: <https://meet.google.com/pda-neug-ajy>

Time (GMT+7)	Content	Presenter
9h30 – 9h45	Presentation 1 Mathematical Modeling on Transmission Analysis of Coinfection: Ika Virus and Dengue Fever	Sayooj Aby Jose and R. Raja Alagappa University
9h45 – 10h10	Presentation 2 (Key Presentation)	Roozbeh Hazrat,

	Sandpiles, Chips and Algebra	University of Western Sydney
10h10 – 10h35	Presentation 3 (Key Presentation) Lie Theory – Classification, Representations and Applications in Economics	Le Anh Vu, University of Economics and Law, VNU HCM
10h35 – 10h50	Presentation 4 On The Classification Of Lie Algebras Whose Non-Trivial Coadjoint Orbits Are Of Codimension 1	Ha Van Hieu, Le Anh Vu, University of Economics and Law, VNU HCM Duong Qang Hoa, Hoa Sen University
10h50 – 11h15	Presentation 5 (Key Presentation) Some Problems in Regularity Theory for Partial Differential Equations	Le Xuan Truong, University of Economics Ho Chi Minh City
11h15 – 11h30	Presentation 6 A Direct Method Based On Chebyshev Wavelets For Approximating The Solutions Of Variable-Order Fractional Differential Equations	Nguyen Thi Viet Nhan, Lawrence S. Ting School Trinh Trong Nhan, Binh My High School Ngô Hoàng Thiên, Thu Khoa Nghia High School for the Gifted Vo Ngoc Thieu Ton Duc Thang University
11h30 – 11h45	Presentation 7 Regularity of Solutions for a Class of Quasilinear Elliptic Equations Related to The Caffarelli-Kohn-Nirenberg Inequality	Le Cong Nhan, Ho Chi Minh City University of Technology and Education Ky Ho, University of Economics Ho Chi Minh City Le Xuan Truong University of Economics Ho Chi Minh City
11h45 – 12h00	Presentation 8 Calderón-Zygmund Estimates for a Parabolic Schrodinger System	Nguyen Ngoc Trong, Ho Chi Minh City University of Education Le Xuan Truong, University of Economic, Ho Chi Minh City Do Duc Tan Vietnamese-German University
12h00 – 12h15	Presentation 9 Strong Convergence of a Shrinking Projection Method for Three Asymptotically Quasi $SGS-\Phi$ Nonexpansive Mappings in Banach Spaces with Directed Graphs	Nguyen Trung Hieu, Dong Thap University

Section of Research and Teaching Information Technology

Location: Lecture Hall 1

Link online: <https://meet.google.com/yej-azyp-vix>

Time (GMT+7)	Content	Presenter
9h30 – 9h50	Presentation 1 Trends Transforming the Information Technology Industry	Truong Minh Tuan, AT Corporation Company
9h50 – 10h10	Presentation 2 Digital Transformation in Online Teaching at Thai Nguyen University	Pham Ngoc Phuong, Thai Nguyen University
10h10 – 10h30	Presentation 3 Flooding attacks on AODV routing protocol in vehicular ad hoc network: prevention and detection solutions review	Nguyen Quoc Anh Dong Thap University
10h30 – 10h50	Presentation 4 Understanding Engagement with U.S. (Mis) Information News Sources on Facebook	Nguyen Minh Kha, Université Grenoble Alpes Grenoble, France
10h50 – 11h10	Presentation 5 Two strategies of the binary classification problem	Nguyen Thanh Vi, Nguyen The Cuong, Truong Ngoc Hai, Nguyen Duc Tuan and Tran Khanh Lam, Telecommunications University
11h10 – 11h30	Presentation 6 A Scale and Rotation Invariant Feature based on the spatial organization of key points for camera-Based information spotting	Dang Quoc Bao, Nancy University, France

Section of Research and Teaching Natural Sciences

Location: Meeting Room

Link online: <https://meet.google.com/oyv-qffr-cyg>

Time (GMT+7)	Content	Presenter
9h30 – 10h00	Presentation 1 Exploring Problem Based Learning and Cooperative approach in learning Organic Chemistry concepts	Elmer A. Irene, Samar State University
10h00 – 10h30	Presentation 2 Formulation and Evaluation of Natural soaps blended with Carrot (<i>Daucus carota</i>) Peel Extract Additives and plant-based Oils	Mendano, R. V, Samar State University
10h30 – 11h00	Presentation 3 Detecting Heavy Metals in the Estuaries of Maqueda Bay Using Macrophytes	Ariel B. Mabansag, Samar State University

APPLICATION OF OP-AMP: CURRENT - VOLTAGE CONVERTERS CIRCUITS, CIRCUITS WITH RESULTS 123, 234, . . . , 789

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Abstract

This article researches two types of Op-Amp circuits: type 1 consists of 3 electronic circuits (with the function of converting between current - voltage), type 2 includes 9 circuits (which have results: 123, 234, 345, 456, 567, 678, 789). With type 1, between the input (current - voltage), the output (current - voltage) will be dependent on the value of resistors connected outside the Op-Amp circuits. The main research method is calculation with hand calculator, Excel software, Proteus (software to draw circuits), Desmos (software to modulate circuits). This article contributes variety of Op - Amp electronic circuits in both theory and application. .

Keywords: *electronic components, Op-Amp, transforms current to voltage, transforms voltage to current, amplifier current..*

1. Introduction

With continuous development of electronic technology, electronic components be made in a more sophisticated and modern way. However, the IC 741 (Operational Amplifier Integrated Circuit) still is one of the most active feature components. The symbol 741 means that the IC has 7 function pins, 4 input pins and 1 output pin (Ravi Teja, 2021). By simply external attaching, we can create Op-Amp circuits with new features. Circuits types 1 (to convert between currents - voltages) and circuit types 2 (have results in 123, 234, 345, 456, 567, 678, 789) have created a surprise because of their novel properties..

2. Results of Researcher

2.1. *The popular featurers of Op-Amp*

We have popular featurers of aplication O-Amp circuits (Ravi Teja, 2021):

- Amplifier: IC 741 is used to amplify the signals which have different frequencies from DC to higher radio frequency. It is also used in frequency-selective amplifiers to filter out signals of unwanted frequencies, example: tone control systems in stereo and Hi Fi systems.

- The circuit performs math operations: integral, differential, summation, subtraction, etc.

- Precision rectifier: then IC 741 acts as a diode.

- Oscillator circuit: there are different output waveforms such as sine, square, triangle, etc. Also used in pulse width modulators (PWM generators).
- Comparator circuit: IC 741 can be used in voltage stabilizer and signal comparison.
- ADC / DAC: IC 741 is used to create a digital to analog converter, example: from a binary input from a computer or microcontroller, and convert it to analog signals, corresponding voltage levels (supplied to the motor). Similarly, it is also possible to convert an analog signal to a digital signal.

2.2. New results of researcher for Op-Amp circuits

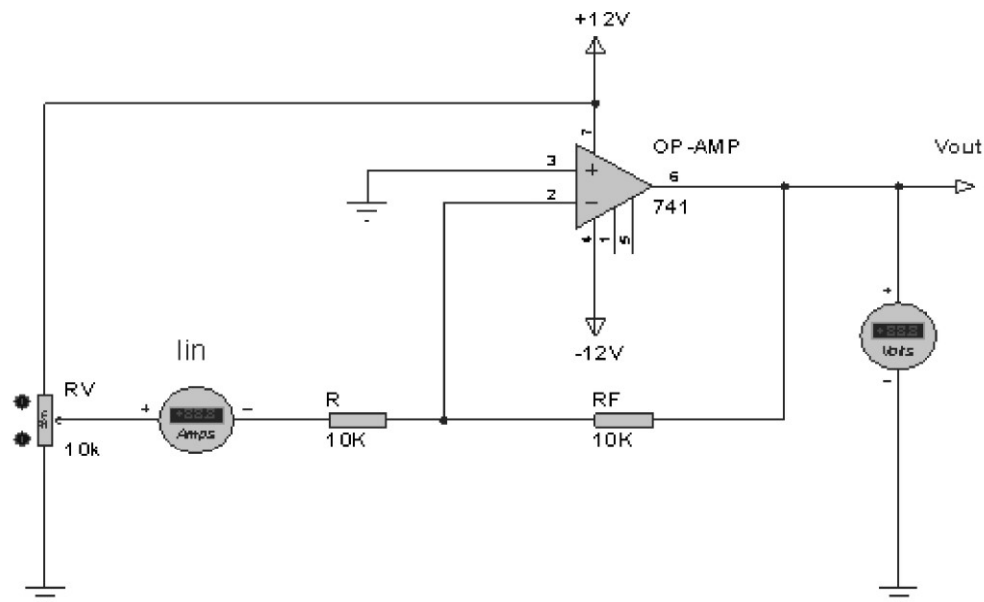
There are two new types of Op-Amp application circuits which built on relatively simple circuit diagrams. However, the principle of the two types of application circuits below is convenient and mathematically fun.

* **Type 1:** Op-Amp circuits to convert voltage-current (Duong Nguyen Trinh, Sam Le Hai Hai Luong Ngoc, Cuong Quoc Nguyen, 2006).

Circuit 01: Circuit with current be converted to voltage

After proving, we have the formula to calculate V_{out} of circuit 01:

$$V_{out} = -RF * I_{in} = -10 * I_{in}$$



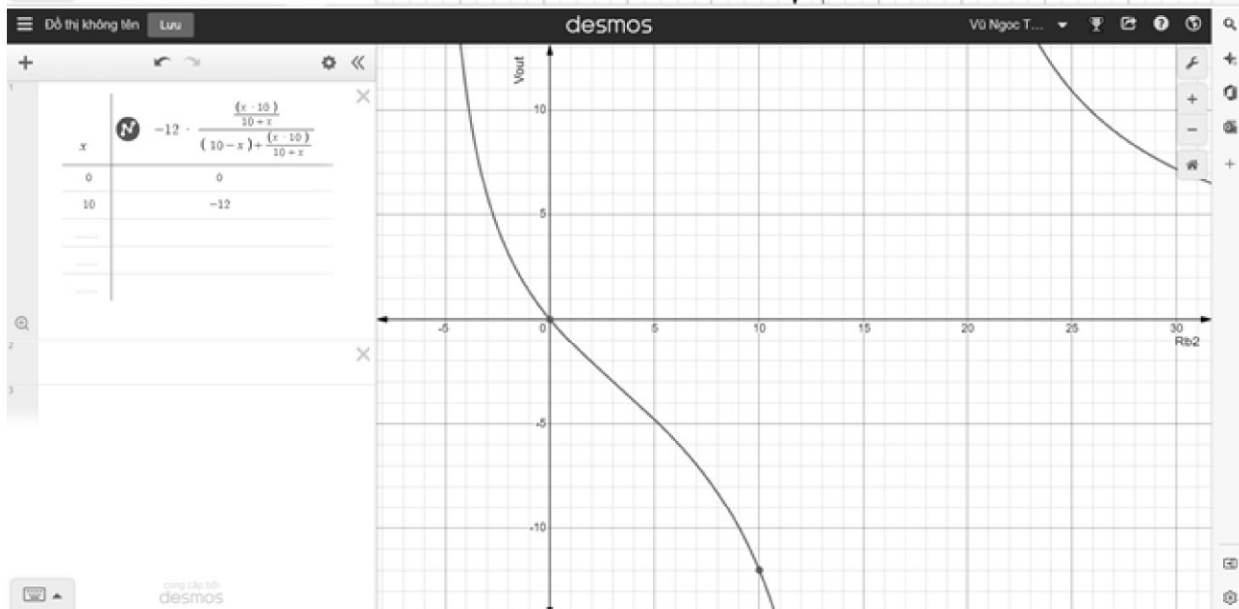
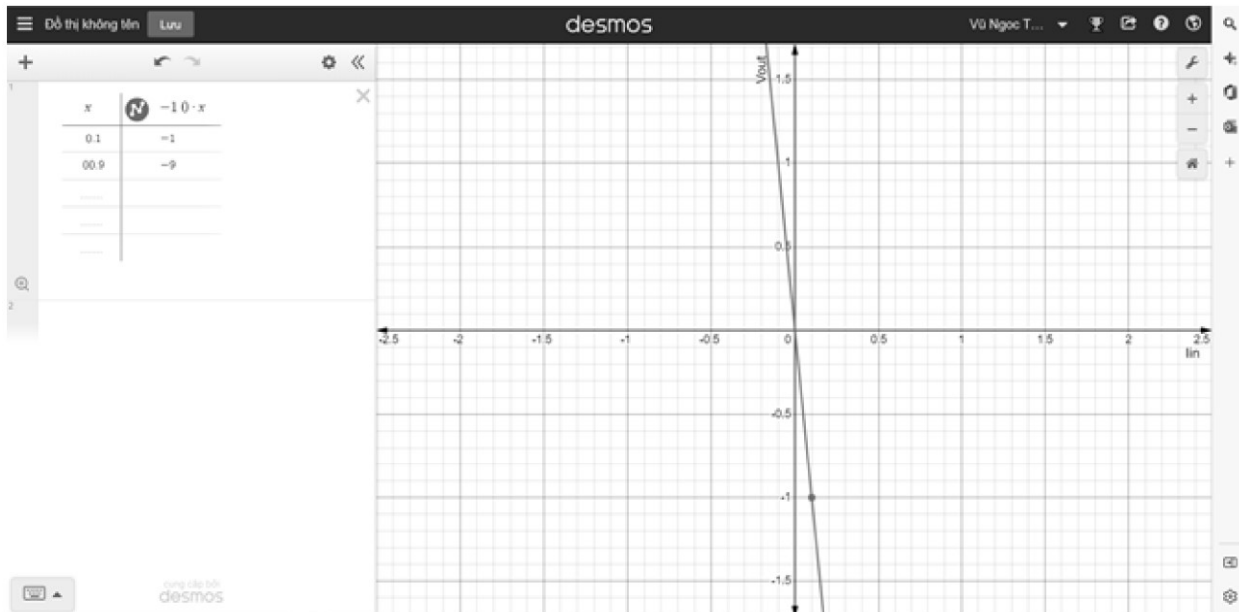
This is an inverting amplifier for voltage (Ha Tran Thu, Nga Truong Thi Bich, Luong Nguyen Thi, Dan Bui Thi Tuyet, Hieu Phu Thi Ngoc, Tu Duong Thi Cam, 2013), in addition, V_{in} is derived from the voltage divider bridge formula. However, from a different perspective, it is the relationship between the output voltage (V_{out}) and the input current (I_{in}).

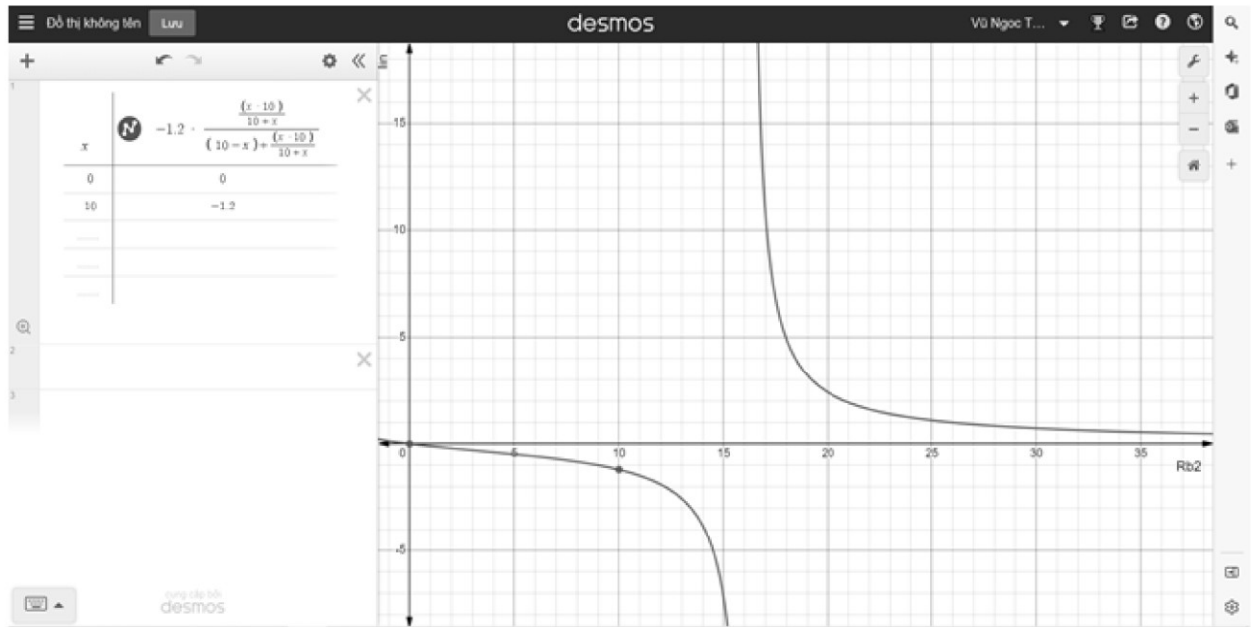
Simulation results for verification:

Three graphs respectively represent the relationships between V_{out} and I_{in} , V_{out} with

I_{in}	V_{out}
0,1mA	-1V
0,3mA	-3V
0,5mA	-5V
0,7mA	-7V
0,9mA	-9V

R_{b2} (R_v consists of two resistors in series, R_{b1} connects +12V, R_{b2} connects GND), I_{in} with R_{b2} . The axes are scaled differently for easy observation.

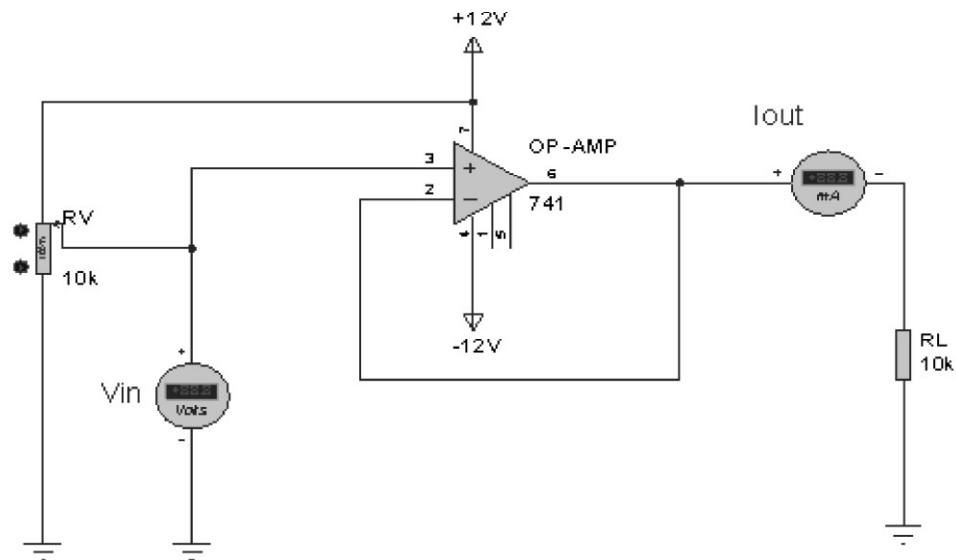




Circuit 02: Circuit with voltage be converted to current

After proving, we have the formula to calculate I_{out} of the circuit:

$$I_{out} = V_{in}/R_L = 0,1V_{in}$$

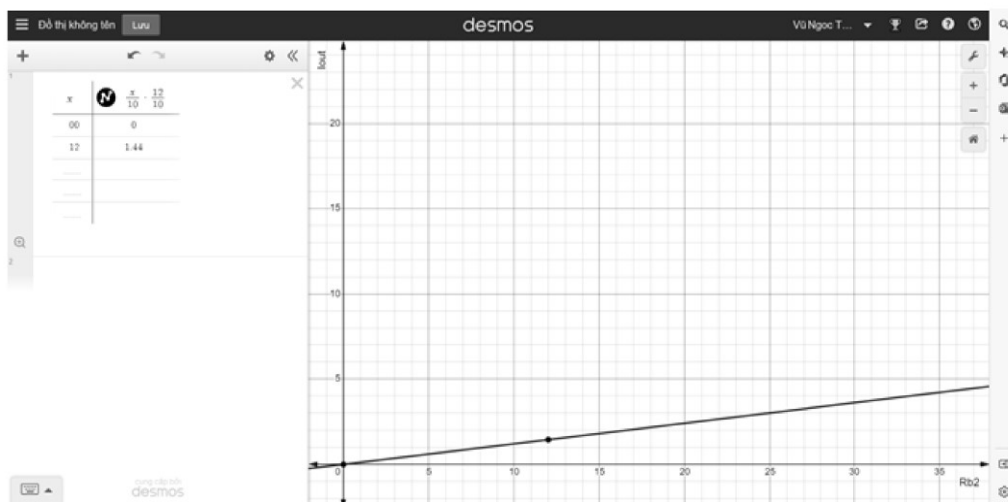
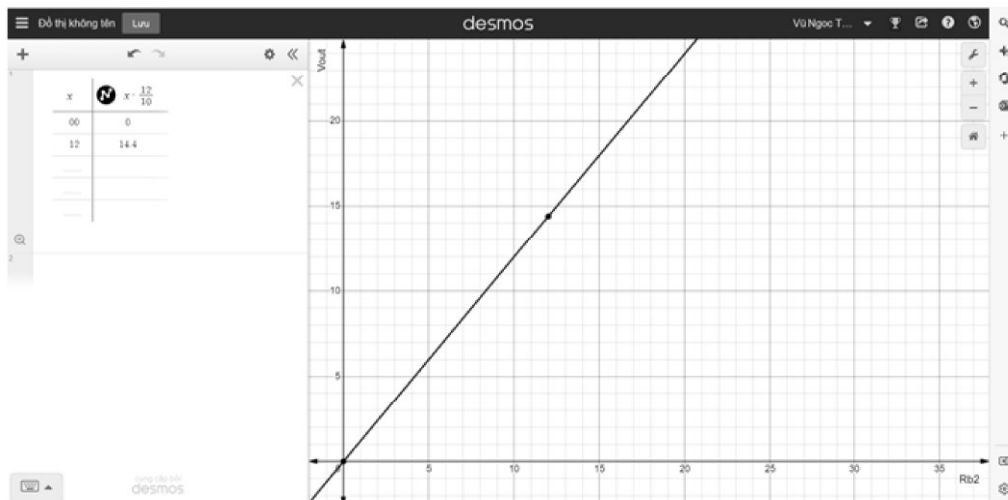
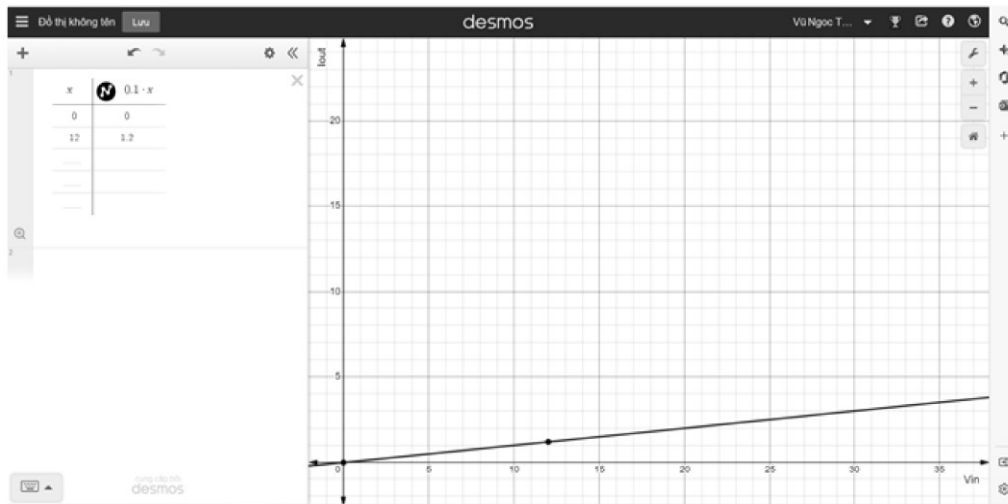


This is a buffer circuit for voltage (Ha Tran Thu, Nga Truong Thi Bich, Luong Nguyen Thi, Dan Bui Thi Tuyet, Hieu Phu Thi Ngoc, Tu Duong Thi Cam, 2013). However, from a different perspective, it is the relationship between the output current (I_{out}) and the input voltage (V_{in}).

Simulation results can be used to verify:

I_{in}	V_{out}
1V	0,1mA
3V	0,3mA
5V	0,5mA
7V	0,7mA
10V	1mA

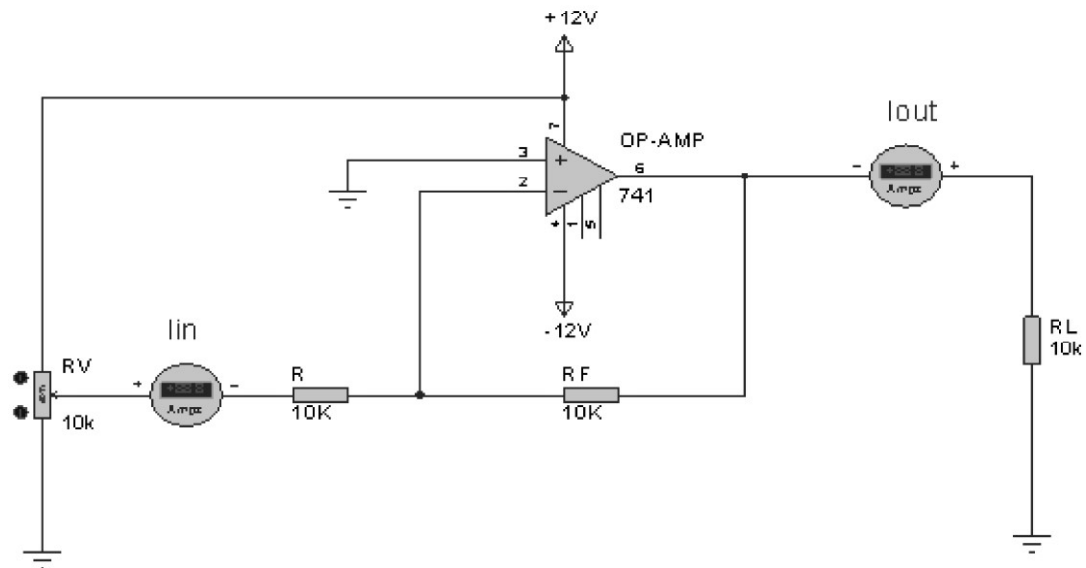
Three graphs respectively represent the relationship between I_{out} with V_{in} , V_{out} with R_{b2} , I_{out} with R_{b2} . The axes are scaled differently for easy observation.



Circuit 03: Current amplifier

After proving, we have the formula for calculating V_{out} of application circuit 03:

$$I_{out} = I_{in} * R_F / R_L = n * I_{in}$$



To set $R_F = n * R_L$ with n is 1, 2, 3, 4,...So, the current gain is n times.

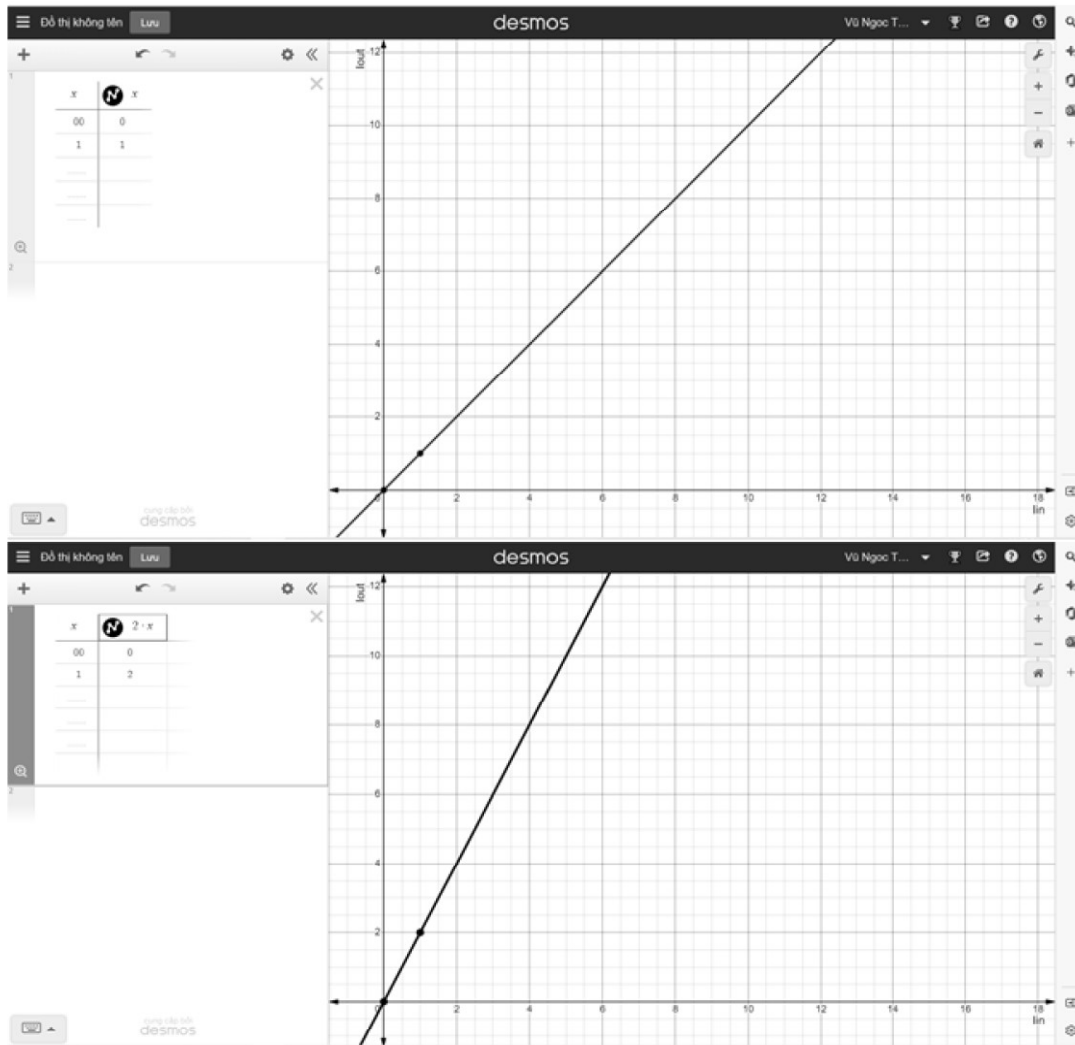
This circuit 03 is actually circuit 01 with the addition of a 10K load resistor. Therefore, instead of drawing 3 graphs as above, the researcher only draws one of graph below.

Simulation results for verification (because $R_F = R_L$, $n=1$):

I_{in}	I_{out}
0,2mA	0,2mA
0,4mA	0,4mA
0,6mA	0,6mA
0,8mA	0,8mA
1mA	1mA

The graph shows the relationship between I_{out} and I_{in} . The axes are scaled with the same scale, respectively with $n=1$, $n=2$.

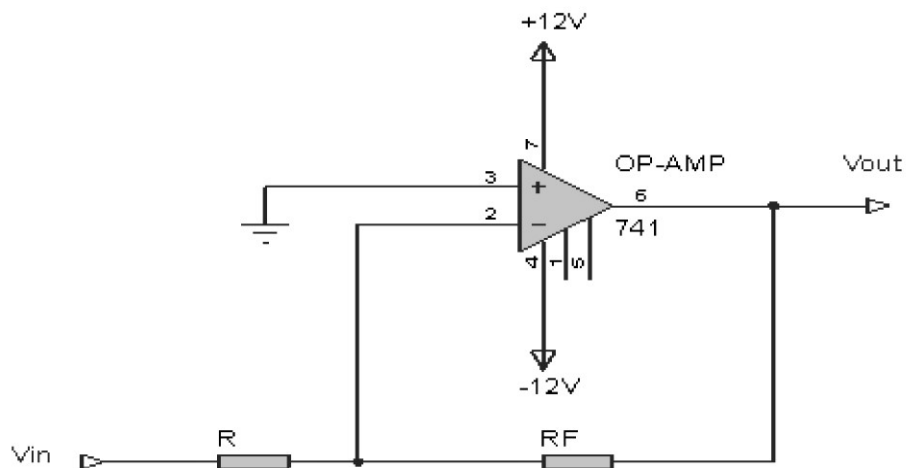
Comment: The current amplification factor of the circuit is n . Higher n is, higher slope of line increases.



* **Type 2:** Op-Amp Circuits with the results 123, 234,...789

This is the familiar inverting amplifier circuit that many documents have presented. Called inverting amplifier because V_{out} and V_{in} have different signs. Supposing that V_{out} is in mV and is not positive saturation of $+12V$ or negative saturation of $-12V$.

$$V_{out} = -\frac{R_f}{R} V_{in}$$



The following data table was found by using Excel for listing and selecting to find the

result of 3 numbers forward.

Vin	Rf	R	Vout
-14,76	15	1,8	123
-28,08	15	1,8	234
-41,40	15	1,8	345
-54,72	15	1,8	456
-81,36	15	1,8	678
-94,68	15	1,8	789

3. Conclusion

The article has built Op-Amp electronic circuits with new features (type 1 with 3 circuits, type 2 with 9 circuits). The grouping of electronic circuits which have similar or related properties shows the flexible nature of Op-Amp. This further confirms the correctness of the electronic circuits even though the external resistors are assembled in the same positions but with different values. Besides, it will increase application range and diversity of Op-Amp circuit.

Acknowledgment The author of the article would like to thanks to Prof. Dr. Ha Tran Thu, Master Nga Truong Thi Bich (lecturers at Ho Chi Minh City University of Technology and Education).

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- Ravi Teja. (9/4/2021). IC741 Op-Amp Basics characteristic, pin configuration applications. Internet: <https://www.electronicshub.org/ic-741-op-amp-basics/>.
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