

ADVANCED CALCULATOR

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TABLE OF CONTENTS

- (1) Linear Regression (HP33S Calculator)**
 - (A) Line of best fit slope**
 - (B) Line of best fit y-intercept**
 - (C) Line of best fit correlation coefficient**

- (2) Linear Regression (TI-83 Calculator)**
 - (A) Line of best fit slope**
 - (B) Line of best fit y-intercept**
 - (C) Line of best fit correlation coefficient**

- (3) Integration with HP33S**

- (4) Examples of integration with HP33S**

- (5) Examples of integration with TI-83**

- (6) Examples of integration with TI-86**

- (7) Calculus problems**
 - (A) Slope**
 - (B) Area**
 - (C) Use of TI-83 to find maximum value of y**
 - (D) Maximizing and Minimizing problems**
 - (E) Related Rates problems**

- (8) Calculus formulas**
 - (1) Derivatives**
 - (2) Integration**
 - (3) Area**
 - (4) Volume**

- (9) Geometric Drawings**
 - (A) Involving area (Calculus)**

(B) Involving solids of revolution (Calculus)

(10) Physics Problems

(A) Velocity

(B) Acceleration

(C) Trajectory

(11) Determinants

(1) Using TI-83 Calculator

(2) Problems involving determinants

(12) Volume of rectangular box given 3 faces

(13) Extra word problems

(14) Conversion factors

(15) Important formulas

LINEAR REGRESSION (HP 33S)

- (1) What is the best-fit y-intercept for the points (0.33, 0.411), (0.98, 1.1), (1.3, 1.88) and (2.1, 2.1)?

Clear all calculator.

.411 ENTER .33 Σ^+

1.1 ENTER .98 Σ^+

1.88 ENTER 1.3 Σ^+

2.1 ENTER 2.1 Σ^+

PURPLE L.R. Select "b"

Answer : .211

- (2) What is the slope of the best-fit line through the data (8, - 6), (- 6, 3), (- 4, - 1), (- 2, - 9), and (0, - 15)?

Clear all calculator.

-6 ENTER 8 Σ^+

3 ENTER -6 Σ^+

-1 ENTER -4 Σ^+

-9 ENTER -2 Σ^+

-15 ENTER 0 Σ^+

PURPLE L.R. Select "m"

Answer : - .568

- (1) What is the best-fit y-intercept for the points (0.33, 0.411), (0.98, 1.1), (1.3, 1.88) and (2.1, 2.1)?

STAT **EDIT** **Clear lists**

L₁ : **.33** **ENTER** **.98** **ENTER**

1.3 **ENTER** **2.1** **ENTER**

L₂ : **.411** **ENTER** **1.1** **ENTER**

1.88 **ENTER** **2.1** **ENTER**

STAT **▸ (Calc)** **LinReg(ax + b)** **ENTER** **Y-intercept = b = .211**

- (2) What is the slope of the best-fit line through the data (8, - 6), (- 6, 3), (- 4, - 1), (- 2, - 9), and (0, - 15)?

STAT **EDIT** **Clear lists**

L₁ : **8** **ENTER** **-6** **ENTER**

-4 **ENTER** **-2** **ENTER**

0 **ENTER**

L₂ : **-6** **ENTER** **3** **ENTER**

-1 **ENTER** **-9** **ENTER**

-15 **ENTER**

STAT **▸ (Calc)** **LinReg(ax + b)** **ENTER** **Slope = a = .568**

$$\int_0^{\frac{\pi}{4}} \cos 2x dx =$$

GREEN **CLEAR** **ALL** **Clear entire calculator.**

Set calculator in radian mode!

PURPLE **EQN** **Prepare to write function.**

cos **2** **X** **STO** **x** **PURPLE** **)** **Write function.**

ENTER **C** **Enter equation and clear.**

0 **ENTER** **PURPLE** **π** **4** **\div** **Set lower limit and upper limit.**

PURPLE **EQN** **Request equation f(x).**

PURPLE **\int** **x** **Integrate.**

Answer : .500

INTEGRATION WITH TI-83 CALCULATOR

$$\int_a^b f(x) dx =$$

$y =$ **CLEAR** $f(x)$

2nd **CALC** $\int f(x)dx$

a **ENTER** b **ENTER**

(1) $\int_1^4 \sqrt{x} dx =$

$y =$ **CLEAR** **2nd** $\sqrt{}$ **Alpha** x **)**

2nd **CALC** $\int f(x)dx$

1 **ENTER** **4** **ENTER**

Answer : 4.67

(2) $\int_1^2 (6x^2 + 4x + 2) dx =$

$y =$ **CLEAR** **6** **Alpha** x x^2 **+** **4** **Alpha** x **+** **2**

2nd **CALC** $\int f(x)dx$

1 **ENTER** **2** **ENTER**

Answer : 22.0

INTEGRATION WITH TI-86 CALCULATOR

$$\int_a^b f(x)dx =$$

2nd CALC fnInt

f(x) , Alpha x , a , b) ENTER

(1) $\int_1^4 \sqrt{x} dx =$

2nd CALC fnInt

2nd $\sqrt{}$ (Alpha x) ,

Alpha x , 1 , 4) ENTER **Answer : 4.67**

(2) $\int_1^2 (6x^2 + 4x + 2) dx =$

2nd CALC fnInt

6 Alpha x x² + 4 Alpha x + 2 ,

Alpha x , 1 , 2) ENTER

Answer : 22.0

CALCULUS PROBLEMS

(1) What is the slope of the curve $y = 5x^3 - 3x$ at $x = 4$

$$f'(x) = \frac{dy}{dx} = 15x^2 - 3^x \ln 3$$

$$f'(4) = 15(4)^2 - 3^4 \ln 3 = 151$$

TI-83 : $y=$ $Clear$ 5 $Alpha$ x \wedge 3 $-$ 3 \wedge $Alpha$ x
 $2nd$ $Calc$ $\frac{dy}{dx}$ 4 $ENTER$

Answer : 151

- (2) At what value of x does the curve $y = 50x^2 - 200x + 20$ have a slope equal to x?

$$y' = 100x - 200$$

$$100x - 200 = x ; 99x = 200 ; x = \frac{200}{99} = 2.02$$

- (3) What is the integral of the curve $y = 50\sin(3x)$ [rad] between $x = 0$ and $x = 4$?

$$\int_0^4 50 \sin 3x dx =$$

Solve integral with either HP or TI calculator.

$$\text{Let } u = 3x ; \frac{du}{dx} = 3 ; du = 3dx ; \frac{1}{3} du = dx$$

$$50 \int \sin u \left(\frac{1}{3} du\right) = \frac{50}{3} \int \sin u du = -\frac{50}{3} \cos u = -\frac{50}{3} \cos 3x$$

CALCULUS FORMULAS

(1) If $y = cu^n$, then $y' = ncu^{n-1} \frac{du}{dx}$. **Power Rule**

(2) If $y = u(v)$, then $y' = u \frac{dv}{dx} + v \frac{du}{dx}$. **Product Rule**

(3) If $y = \frac{u}{v}$, then $y' = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$. **Quotient Rule**

(4) If $y = \sin u$, then $y' = \cos u \frac{du}{dx}$.

(5) If $y = \cos u$, then $y' = -\sin u \frac{du}{dx}$.

(6) If $y = \tan u$, then $y' = \sec^2 u \frac{du}{dx}$.

(7) If $y = \ln u$, then $y' = \frac{u'}{u}$.

(8) If $y = e^u$, then $y' = e^u \frac{du}{dx}$.

(9) $\int \cos u du = \sin u + C$

(10) $\int \sin u du = -\cos u + C$

(11) $\int \sec^2 u du = \tan u + C$

(12) $\int \frac{du}{u} = \ln|u| + C$

(13) $\int e^u du = e^u + C$

GEOMETRIC AREA AND VOLUME PROBLEMS

(1) **Area** = $\int_a^b [f(x) - f(x)] dx$

$$\int_1^2 x e^x dx =$$

TI-83 Calculator

MATH **SelectfnInt(**

Alpha **x** **2nd** **e^x** **Alpha** **x** **)** **,**

Alpha **x** **,** **1** **,** **2** **)** **ENTER**

Answer : 7.39

HP33S Calculator

GREEN **Clear** **All**

Purple **EQN**

STO **x** **X** **e^x** **STO** **x**

PURPLE **)** **ENTER** **C**

1 **ENTER** **2** **PURPLE** **EQN**

PURPLE **∫** **x** **Answer : 7.39**

PHYSICS PROBLEMS

(1) **A car accelerates from rest to 60 mph in 7.4 s. How long must the**

total distance traveled?

To change from miles per hour to feet per second multiply by $\frac{22}{15}$.

$$60 \text{ mph} = 60 \left(\frac{22}{15} \right) \text{ ft/sec} = 88 \text{ ft/sec}$$

Let d = total distance traveled

.002d = distance while car is accelerating

.998d = distance car is being driven at the rate of 60 mph (88 ft/sec)

$$v = v_0 + at$$

$$88 = 0 + a(7.4) ; a = \frac{88}{7.4}$$

$$x = x_0 + v_0 t + \frac{1}{2} at^2$$

$$x = 0 + 0t + \frac{1}{2} \left(\frac{88}{7.4} \right) (7.4)^2 = 325.6 \text{ feet}$$

$$.002d = 325.6 ; d = 162,800$$

$$.998d = .998(162,800)$$

$$\text{Distance} = \text{Rate} \times \text{Time} ; \text{Time} = \frac{\text{Distance}}{\text{Rate}} = \frac{.998(162,800)}{88} \text{ seconds} =$$

$$\frac{.998(162,800)}{88} \left(\frac{1}{60} \right) \text{ minutes} = 30.8 \text{ minutes}$$

DETERMINANTS

1. What is DetG if $G = \begin{vmatrix} -4 & 9 & 3 \\ 1 & 19 & 2 \\ 7 & -5 & 10 \end{vmatrix}$?

2nd MATRIX ▷ ▷ (Edit) Select[A]

3 ▷ 3 ENTER

(-) 4 ENTER 9 ENTER 3 ENTER

1 ENTER 19 ENTER 2 ENTER

7 ENTER (-) 5 ENTER 10 ENTER

2nd MATRIX ▷ (Math) Select det(

2nd MATRIX Select[A] ENTER

Exact answer is – 1178. The answer for the UIL Calculator test is – 1180.

2. For what value of t does $C_{12} = 0$ if $C = AB$, $A = \begin{bmatrix} -2 & t \\ 5 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & 12 \\ -7 & 6 \end{bmatrix}$?

$$C = AB = \begin{bmatrix} (-2)(9) + (-7)(t) & (-2)(12) + (t)(6) \\ (5)(9) + (1)(-7) & (5)(12) + (1)(6) \end{bmatrix} = \begin{bmatrix} -18 - 7t & -24 + 6t \\ 45 - 7 & 60 + 6 \end{bmatrix}$$

Note : C_{12} is the term located in row “1” column “2”. This term is $-24 + 6t$.

$$-24 + 6t = 0 ; 6t = 24 ; t = 4.00$$

CONVERSION FACTORS

1 year = 365,256 days

1 inch = 2.54 centimeteres

1 square mile = 640 acres

1 teaspoon(tsp) = 1/6 ounces (liquid oz)

1 tablespoon (tbs) = 0.5 ounce (liquid oz)

1 gallon = 128 ounces

1 cubic foot \approx 7.481 gallons

1 liter = 1.0567 quarts

1 pound = 453.592 grams

**$^{\circ}\text{C} = 5(^{\circ}\text{F} - 32)/9 \approx \text{K} - 273.15$ where $^{\circ}\text{C}$ = degrees Celsius,
 $^{\circ}\text{F}$ = degrees Fahrenheit and K = Kelvins**

Metric System prefixes

**nano(n, 10^{-9}), micro(μ , 10^{-6}), mill (m, 10^{-3}), centi(c, 10^{-2}), deci(d, 10^{-1})
hecto(h, 100), kilo(k, 10^3), mega (M, 10^6)**

Length of football field (without end zones) = 100 yards

Density(water) = 1 gram/cubic centimeter (g/cc, g/cm³)

G = acceleration on earth = - 32.17 ft/s²

Radius of the earth = 3960 miles

$1 + x + x^2 + x^3 + x^4 + \dots = (1 - x)^{-1}$; $x^2 < 1$