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After turning your calculator on, press F1 then 8 to clear the home screen.

#1. Find $\lim_{x \to 0} \left(1 + \frac{x}{2}\right)^{1/(2x)}$.

Solution:

Press MODE then F2, set calculator to EXACT

Press ENTER twice

Press ♦Y = , cursor to y1 and CLEAR it if necessary

Set y1(x) = (1 + x/2) ∧ (1/(2x)), press ENTER

Press 2nd-QUIT

Type in **limit(y1(x), x,0)**

Press ENTER

#2. Find the maximum and minimum values of the function $f(x) = x^3 - 6x^2 + 3x + 1$ on the interval $[-1, 6]$.

Solution:

Press ♦ Y= , set y1(x) = x∧3 - 6x∧2 + 3x + 1, press ENTER

Press ♦ WINDOW, set xmin = -1, xmax = 6, ymin = -20, ymax = 20

Press ♦ GRAPH

Press 2nd-QUIT, type in **y1(6)**

Press ENTER to get the maximum value

Press F2 then 1 then 2nd-*d* (above the 8)

Type in **y1(x),x)=0,x)**

Press ENTER

Type in **y1(**$\sqrt{\ }$ then **3) + 2)**

Press ENTER to get the minimum value

#3. Let $f(x) = x^3 - 2x$. On what interval(s) is the graph of f both rising and concave up?

Solution:

Press ♦ Y=, set y1(x) = x∧3 - 2x, y2(x) = d(y1(x),x), y3(x) = d(y2(x),x), where d is over the 8

Use the cursor and F4 to turn off y1

Press ♦ WINDOW then F2 then 6

Press 2nd-QUIT

Press F2 then 1

Type in **y2(x)*y3(x)=0,x)**

Press ENTER

Press ♦ GRAPH to recall the graph, and get the answer $(\sqrt{6}/3, \infty)$

#4. Let L be the line which is tangent when $x = 1$ to the graph of $f(x) = x^2 - 4x + 5 + 5\sin x$. Find the area of the triangle formed by L and the coordinate axes.

Solution:

Press MODE then F2, set calculator to APPROXIMATE.

Press ♦ Y = , set y1(x) = x ∧ 2 - 4x + 5+5 sin(x), press ENTER

Set y2(x) = d(y1(x), x) (the d is 2nd-8), press ENTER

Cursor up and press F4 to turn off the graph of y2(x)

Set y3(x) = y1(1) + y2(1)(x-1), press ENTER

Press ♦ WINDOW

Press F2 then 6 (then wait a minute)

Press 2nd-QUIT

Press F2 then 3

Type in **y3(x))** after the left parenthesis, press ENTER

Press the up cursor then ENTER

Edit the entry line to solve (F2 then 1) for the x-intercept by putting the entry line in the form **solve(mx+b=0, x)**, then press ENTER

Press the up cursor then ENTER, make the entry line read .5* (minus the number from the screen) * y3(0), press ENTER

#5. Find a function y satisfying $\frac{dy}{dx} = x^3 e^{3x}, y(1) = 5$.

Solution:

Set the mode to AUTO (MODE then F2 then cursor)

Press F3 then 2

Type in **x∧3***e**∧(3x),x)** after the left parenthesis

Press ENTER

Press CLEAR, hit the up-cursor, press ENTER

At the left end of the entry line, type **1** then press STO ▶ then type **x** then type **:** (colon)

Now insert **solve(** directly after the colon by pressing F2 then **1**

At the right end of the entry line add: **+c=5,c)**

Press ENTER

#6. Let $f(x) = kx - x^2$, where k is a positive constant. Call R the region in the first quadrant enclosed by the graph of f and the x-axis . Find a value for k such that the volume of the solid obtained when R is revolved about the x-axis is the same as the volume of the solid obtained when R is revolved around the y-axis.

Solution:

Press ♦ Y= , set y1(x)= k*x - x∧2, press ENTER, press 2nd-QUIT

Press F2 then 1

Press F3 then 2

Type in **π y1(x)∧2,x,0,k)=**

Press F3 then 2

Type in **2π x*y1(x),x,0,k),k)**

Press ENTER

#7. Find a constant $k > 1$ such that the curve $y = \frac{kx^6}{6} + \frac{1}{16kx^4}$ has length 20 over the interval $1 \le x \le 2$. Check your answer graphically.

Solution:

Press F3 then **8**

Type in **k*x∧6/6+1/(16k*x∧4), x,1,2)** after the left parenthesis, press ENTER

Press CLEAR

Press the up cursor, then press ENTER

Edit the entry line to **solve** the expression **=20,k)** (F2-1 gives **solve**)

Press ENTER

Press ♦ ENTER

Check:

Press ♦Y = , set y1(x) = 1.90183 x∧6/6 + 1/(16*1.90183x∧4), press ENTER

Press ♦WINDOW, set xmin = .9, xmax = 2.1, ymin = -5, ymax = 30

Press ♦GRAPH

Press F5 then B

Type **1** then press ENTER

Type **2** then press ENTER

#8. Evaluate $\int_0^\infty x^n e^{-x}\,dx$ for $n = 1, 2, 3, \ldots$ until you can guess a pattern.

Solution:

Press 2nd-QUIT then CLEAR

Press F3 then 2

Type in **x**∧1 ∗ e∧**(-x),x,0,**∞**)** (Note: ∞ is over the J)

Press ENTER

Edit the entry line to read **(x**∧**2***e∧**(-x),x,0,**∞**)**

Press ENTER

Change the exponent to **3**, then **4**, then **5**, then **6**, ..., each time pressing ENTER, until you see a pattern

#9. Find the first partial sum of the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ that is within .01 of the sum of the series.

Solution:

Press CLEAR

Press F3 then 4

Type in **1/n** ∧ **2, n, 1, 50)** after the left parenthesis

Press ENTER

(Press the up cursor, then the right cursor repeatedly to see the whole fraction, then press the down cursor)

Press ♦ ENTER

Press the right cursor, then edit the 50 in the entry line to ∞ (over the J), press ENTER

Press MODE then F2, change "AUTO" to "APPROXIMATE", exit by pressing ENTER twice

Edit the entry line to read **($\pi \wedge$ 2)/6 - $\sum$ (1/n $\wedge$ 2, n, 1, 50)**

Press ENTER

Change the 50 to 70 to 90 to 100, then check 99

#10. How well does the sixth-degree Maclaurin polynomial for $\cos x$ approximate $\cos x$ on the interval $[-1, 1]$?

Solution:

Press F3 then **9**

Type in **cos(x), x, 6)** then press ENTER

Press the up-cursor twice

Press F1 then **5**

Press ♦ Y = , put cursor at y1, press ENTER

Press F1 then **6** then ENTER

Set y2(x) = cos (x), press ENTER

Set y3(x) = abs(y1(x) - y2(x)), press ENTER, turn off graphs (using F4) of y1 and y2

Press ♦ WINDOW, set xmin = -1.1, xmax = 1.1, ymin = 0, ymax = .0002

Press ♦ GRAPH

Press ON, press 2nd-QUIT, press CLEAR

Type in **y3(1)** then press ENTER