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 $y_1(x) = (1 + x/2)^{(1/(2x))}$, 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 $y_1(x) = x^3 - 6x^2 + 3x + 1$, 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{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 \( \larrow Y= \), set \( y_1(x) = x^3 - 2x \), \( y_2(x) = d(y_1(x), x) \), \( y_3(x) = d(y_2(x), x) \), where \( d \) is over the 8

Use the cursor and F4 to turn off \( y_1 \)

Press \( \larrow \) WINDOW then F2 then 6

Press 2nd-QUIT

Press F2 then 1

Type in \( y_2(x) \cdot y_3(x) = 0, x \)

Press ENTER

Press \( \larrow \) 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 \( \larrow Y= \), set \( y_1(x) = x^2 - 4x + 5 + 5 \sin(x) \), press ENTER

Set \( y_2(x) = d(y_1(x), x) \) (the \( d \) is 2nd-8), press ENTER

Cursor up and press F4 to turn off the graph of \( y_2(x) \)

Set \( y_3(x) = y_1(1) + y_2(1)(x-1) \), press ENTER

Press \( \larrow \) WINDOW

Press F2 then 6 (then wait a minute)

Press 2nd-QUIT

Press F2 then 3

Type in \( y_3(x) \) 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 \( \text{solve}(mx+b=0, x) \), then press ENTER

Press the up cursor then ENTER, make the entry line read \( .5^* \) (minus the number from the screen) \( \cdot y_3(0) \), 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 \( \text{ } \) 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 \( \text{ } \) Y= , set \( y_1(x) = kx - x^2 \), press ENTER, press 2nd-QUIT

Press F2 then 1

Press F3 then 2

Type in \( \pi y_1(x) \text{ } \wedge \text{ } 2, x, 0, k) = \)

Press F3 then 2

Type in \( 2\pi x \text{ } \ast \text{ } y_1(x), x, 0, k), k) \)

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 \( 1 \leq x \leq 2 \). Check your answer graphically.

**Solution:**

Press F3 then 8

Type in \( k \text{ } \ast \text{ } x \text{ } \wedge \text{ } 6/6 + 1/(16k \text{ } \ast \text{ } x \text{ } \wedge \text{ } 4), x, 1, 2 \) 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 \( x^1 * e^{(-x),x,0,\infty} \) (Note: \( \infty \) is over the \( J \))

Press ENTER

Edit the entry line to read \( (x^2*e^{(-x)},x,0,\infty) \)

Press ENTER

Change the exponent to 3, then 4, then 5, then 6, \ldots, 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 $\infty$ (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 $y_1$, press ENTER

Press F1 then 6 then ENTER.

Set $y_2(x) = \cos(x)$, press ENTER

Set $y_3(x) = \text{abs}(y_1(x) - y_2(x))$, press ENTER, turn off graphs (using F4) of $y_1$ and $y_2$

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

Press ♦ GRAPH

Press ON, press 2nd-QUIT, press CLEAR

Type in $y_3(1)$ then press ENTER