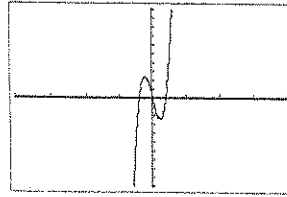


Section 2.4 Graphing Polynomial Functions

To graph a polynomial function:

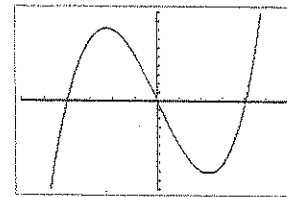
- See Table 2.1 in the text to determine possible shapes for the graph.
(The graph of the function $y = x^3 - 16x$ has one of four shapes in the table.)
- Graph the function in a window large enough to see the shape of the complete graph. This graph is like the graph of Degree 3(b) in the table in Section 2.4.
- If necessary, adjust the window for a better view of the graph.

$[-40, 40]$ by $[-100, 100]$



$y = x^3 - 16x$

$[-6, 6]$ by $[-30, 30]$



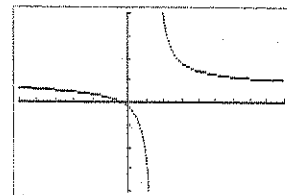
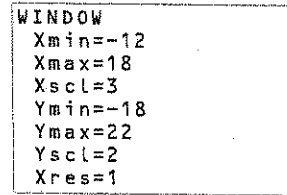
$y = x^3 - 16x$
(Better view)

Section 2.4 Graphing Rational Functions

To graph a rational function:

- Determine the vertical and horizontal asymptotes.
- Set the window so that the x range is centered near the x -value of the vertical asymptote.
- Set the window so that the horizontal asymptote is near the center of the y range.
- Graph the function in a window large enough to see the shape of the complete graph.
- If necessary, adjust the window for a better view of the graph.

To graph $y = \frac{12x + 8}{3x - 9}$, set the center of the window near the vertical asymptote $x = 3$ and near the horizontal asymptote $y = 4$.



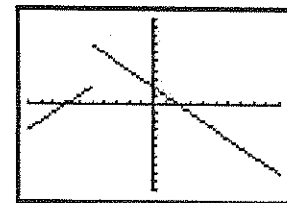
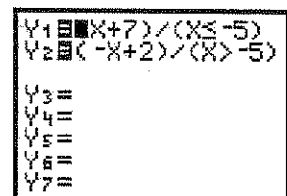
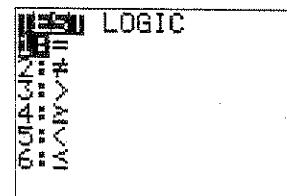
Section 2.4 Graphing Piecewise Defined Functions

A piecewise defined function is defined differently over two or more intervals.

To graph a piecewise defined function $y = \begin{cases} f(x) & \text{if } x \leq a \\ g(x) & \text{if } x > a \end{cases}$

- Go to the Y= key and enter
 $Y_1 = f(x)/(x \leq a)$ and $Y_2 = g(x)/(x > a)$
(The inequality symbols are found under the TEST menu.)
- Graph the function using an appropriate window.
- Evaluating a piecewise defined function at a given value of x requires that the correct equation ("piece") be selected.

To graph $y = \begin{cases} x + 7 & \text{if } x \leq -5 \\ -x + 2 & \text{if } x > -5 \end{cases}$



Three piecewise Applications

(1) Energy Rates

MONTHLY RATE:

Basic Charge: \$7.25 single phase or \$17.41 three phase

Energy Charge:

8.4991¢ per kWh for the first 600 kWh

10.2974¢ per kWh for all over 600 kWh

(2) Income Tax

Schedule X—If your filing status is Single

If your taxable income is:		The tax is:	
Over—	But not over—		of the amount over—
\$0	\$8,500	10%	\$0
8,500	34,500	\$850.00 + 15%	8,500
34,500	83,600	4,750.00 + 25%	34,500
83,600	174,400	17,025.00 + 28%	83,600
174,400	379,150	42,449.00 + 33%	174,400
379,150	110,016.50 + 35%	379,150

(3) Medical Insurance

Medical Insurance

Compare two plans ...

UMP Classic	UMP CDHP
Monthly premium: \$241	Monthly premium: \$95
Family deductible: \$750	Family deductible: \$2,800
Typical Coinsurance: 15% (after deductible met)	Typical Coinsurance: 15% (after deductible met)
Family out of pocket max: \$4,000	Family out of pocket max: \$8,400
	Note: This plan comes with a \$1400 HSA credit

<http://www.hca.wa.gov/pebb/Pages/index.aspx>

(1) Energy Rates

PUGET SOUND ENERGY Electric Tariff G

SCHEDULE 7 RESIDENTIAL SERVICE (Single phase or three phase where available)

AVAILABILITY:

1. This schedule is limited to residential service, which means service that is delivered through one meter to a single-family unit and is used principally for domestic purposes, even though such service may incidentally be used for nondomestic purposes. Electric service for nondomestic use may be separately metered and served under the provisions of the applicable general service schedule, provided that such service does not include single-family units.
2. If this schedule is applied to transient occupancy in separately metered living units, billing shall be in the name of the owner on a continuous basis.
3. Single-phase motors rated greater than 7-1/2 HP shall not be served under this schedule except by the express written approval of the Company.
4. Space conditioning and water heating capacities shall be energized in increments of 6 KW or less by a thermostat, low voltage relay, or suitable time delay equipment.
5. Customers requiring three-phase service under this schedule will be required to contribute the incremental cost of three-phase facilities to provide such service.

MONTHLY RATE:

Basic Charge: \$7.25 single phase or \$17.41 three phase

Energy Charge:

8.4991¢ per kWh for the first 600 kWh
10.2974¢ per kWh for all over 600 kWh

Line 1:

$$7.25 + 0.085 \left(\frac{\# \text{ of}}{\text{kWh}} \right) \quad \text{When}$$

we use 0 to 600 kWh

Line 2:

$$7.25 + 0.085(600) + 0.103 \left(\frac{\# \text{ of kWh}}{\text{over 600}} \right)$$

when we use more than 600 kWh.

Define variables: $k = \# \text{ of kWh}$

$$P \& E(k) = \begin{cases} 7.25 + 0.085k, & 0 \leq k \leq 600 \\ 7.25 + 51 + 0.103(k-600), & k > 600 \end{cases}$$

explanation in words.

(1)

(2)

PSE Rates - Calculator Work

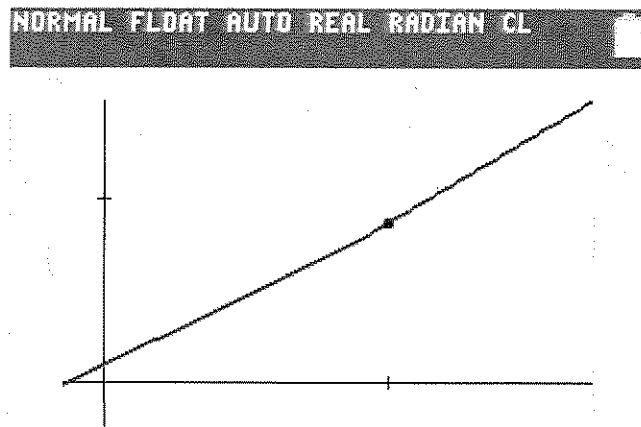
(1.) Entering the Function into the Y=

```
NORMAL FLOAT AUTO REAL RADIAN CL
Plot1 Plot2 Plot3
Y1 (7.25+0.085X)(X≤600)+
(7.25+51+0.103(X-600))(X>6
00)
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
```

(2.) Setting the window (note that the X and Y scale are optional)

```
NORMAL FLOAT AUTO REAL RADIAN CL
WINDOW
Xmin=-100
Xmax=1200
Xscl=700
Ymin=-20
Ymax=120.05
Yscl=78.25
Xres=1
ΔX=4.9242424242424
TraceStep=9.8484848484848
```

(3.) The graph (note that I marked the important point)



(2) Income Tax

2011 Tax Rate Schedules



The Tax Rate Schedules are shown so you can see the tax rate that applies to all levels of taxable income. Do not use them to figure your tax. Instead, see the instructions for line 44.

Schedule X—If your filing status is Single

If your taxable income is:		The tax is:	
Over—	But not over—		of the amount over—
\$0	\$8,500 10%	\$0
8,500	34,500	\$850.00 + 15%	8,500
34,500	83,600	4,750.00 + 25%	34,500
83,600	174,400	17,025.00 + 28%	83,600
174,400	379,150	42,449.00 + 33%	174,400
379,150	110,016.50 + 35%	379,150

(1) Define : $x = \text{taxable income}$.

$$(2) \text{Tax}(x) = \begin{cases} .10x, & 0 \leq x \leq 8500 \\ 850 + .15(x - 8500), & 8500 < x \leq 34500 \\ 4750 + .25(x - 34500), & 34500 < x \leq 83600 \end{cases}$$

Describing the full tax table would require 6 pieces.

Note: To put a compound inequality into the calculator we will multiply.
For example, we input $8500 < x \leq 34500$
as $(8500 < x)(x \leq 34500)$

Income Tax Rates - Calculator Work

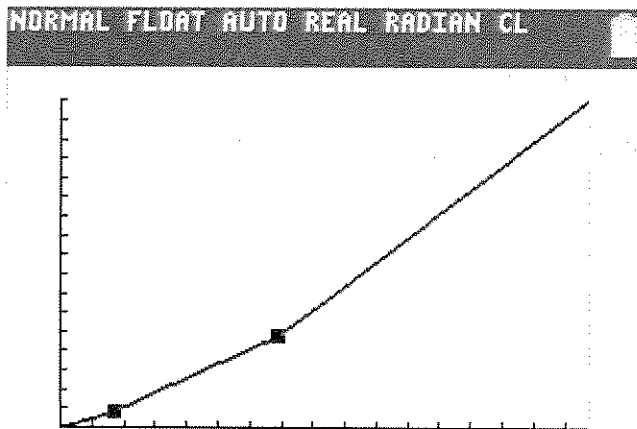
(1.) Entering the Function into the Y=

```
NORMAL FLOAT AUTO REAL RADIAN CL
Plot1 Plot2 Plot3
Y1= .1X(X≤8500)+(850+.15(X-8500))(8500<X)(X≤34500)+(4750+.25(X-34500))(34500<X)(X≤83600)
Y2=
Y3=
Y4=
Y5=
Y6=
```

(2.) Setting the window (note that the X and Y scale are optional)

```
NORMAL FLOAT AUTO REAL RADIAN CL
FUNCTION TRACE VALUES
WINDOW
Xmin=0
Xmax=83600
Xscl=5000
Ymin=0
Ymax=17025
Yscl=1000
Xres=1
ΔX=316.666666666667
TraceStep=33.333333333334
```

(3.) The graph (note that I marked the important points)



(3) Medical Insurance

Medical Insurance

Compare two plans ...

UMP Classic	UMP CDHP
Monthly premium: \$241	Monthly premium: \$95
Family deductible: \$750	Family deductible: \$2,800
Typical Coinsurance: 15% (after deductible met)	Typical Coinsurance: 15% (after deductible met)
Family out of pocket max: \$4,000	Family out of pocket max: \$8,400
	Note: This plan comes with a \$1400 HSA credit

What would the total <http://www.hca.wa.gov/pebb/Pages/index.aspx>
cost be w/ \$4000 medical bills.

CLASSIC

plan 1

$$\begin{array}{r} 241(12) = 2892 \\ \text{ded.} \quad 750 \\ .15(3250) = 487.50 \\ \hline 4129.5 \end{array}$$

CDHP

plan 2

$$\begin{array}{r} 95(12) = 1140 \\ \text{ded.} \quad 2800 \\ .15(1200) = 180 \\ \hline -1400 \\ \hline 2720 \end{array}$$

In this case it is better to have lower premiums & a higher deductible.

Medical Insurance

Compare two plans ...

UMP Classic	UMP CDHP
Monthly premium: \$241	Monthly premium: \$95
Family deductible: \$750	Family deductible: \$2,800
Typical Coinsurance: 15% (after deductible met)	Typical Coinsurance: 15% (after deductible met)
Family out of pocket max: \$4,000	Family out of pocket max: \$8,400
	Note: This plan comes with a \$1400 HSA credit

<http://www.hca.wa.gov/pebb/Pages/index.aspx>

Let x = total amt billed allowed by insurance.

UMP classic

$$C(x) = \begin{cases} 2892 + x & \text{if } 0 \leq x \leq 750 \\ 2892 + 750 + 0.15(x - 750) & \text{if } 750 < x \leq 22417 \\ 2892 + 4000 & \text{if } x > 22417 \end{cases}$$

Note: Annual premiums are $12(241) = \$2892$

UMP CDHP

$$C(x) = \begin{cases} -260 + x & \text{if } 0 \leq x \leq 2800 \\ -260 + 2800 + 0.15(x - 2800) & \text{if } 2800 < x \leq 40133 \\ -260 + 8400 & \text{if } x > 40133 \end{cases}$$

Note: Annual premium includes the credit.

$$95(12) - 1400 = -260$$

Medical Insurance Example - Calculator Work

(1.) Entering the Function into the Y=

Note that Y1 is for UMP Classic while Y2 is for UMP CDHP

```
NORMAL FLOAT AUTO REAL RADI AN CL
Plot1 Plot2 Plot3
Y1=(2892+X)(X≤750)+(2892
+750+.15(X-750))(750<X)(X≤
22417)+(2892+4000)(X>22417
)
Y2=(-260+X)(X≤2800)+(-26
0+2800+.15(X-2800))(2800<X
)(X≤40133)+(-260+8400)(X>4
0133)
Y3=
```

(2.) Setting the window (note that the X and Y scale are optional)

```
NORMAL FLOAT AUTO REAL RADI AN CL
FUNCTION TRACE VALUES
WINDOW
Xmin=0
Xmax=50000
Xscl=5000
Ymin=-500
Ymax=10000
Yscl=500
Xres=1
ΔX=189.39393939394
TraceStep=78.78787878788
```

(3.) The graph (note that I marked the important points).

