Revision Problems Using TI-84

1.	x | y = ? 3 | 12 7 | 16 10 | ? ? | 40	Answer the question marks in case of a linear model. Answer the question marks in case of an exponential model. What is the doubling time? Answer the question marks in case of a power model.
2.	x | y = ? 3 | 12 7 | 16 10 | 18 15 | ? ? | 10	Answer the question marks in case of a quadratic model. Find maxima or minima. Find the equation for the tangent line in x=2. Find the gradient formula. Find the gradient number in x = 5 Find the area formula Find the area number from x= 1 to x = 6 Find the intersection points with the line y = 3 + 2x
3.	x | y = ? 3 | 12 7 | 16 10 | 14 12 | 18 15 | ? ? | 30	Answer the question marks in case of a cubic model. Find maxima and minima. Find the equation for the tangent line in x=2. Find the gradient formula. Find the gradient number in x = 5 Find the area formula Find the area number from x= 1 to x = 6 Find the intersection points with the line y = 3 + 2x
4.	$3x + 4y = 15$ & $5x - 6y = 12$	Solve the simultaneous equations
5.	Given two points in a coordinate system P(2,4) and Q(6,10)	Find the midpoint of the line PQ. Find the equation for the line through P and Q Find the equation for the normal line to PQ passing through P Find the angle between PQ and the x-axis. Find the distance between P and Q Find the distance from the line PQ to the point S(8,1) Find the equation for the circle through P and Q and with the midpoint of PQ as centre. Find the intersection point between the circle and the line y = 12-2x
6.	Let X be a normal random variable with mean m = 100 and standard deviation d = 12	$P(X<89) = ?$ $P(X>108) = ?$ $P(93<X<109) = ?$
7.	X counts the numbers of wins in 100 repetitions of a game with 65% winning chance.	$P(X<70) = ?$ $P(X\leq 60) = ?$ $P(X\geq 58) = ?$ $P(63<X\leq 72) = ?$
8.	$\sin(3x) = 0.4$, $0\leq x\leq 2\pi$ $\text{con}(\frac{1}{2}x) = -0.3$, $0\leq x\leq 2\pi$ $\tan(2x) = 0.7$, $0\leq x\leq 2\pi$	Find the solutions: *Remember to adjust the window* Find the solutions: Find the solutions:
9.	A = 40, b = 7, C = 90	Find a, B and c.
10.	a = 4, c = 7, C = 90	Find A, B and b.
11.	A = 40, b = 7, C = 68	Find a, B and c.
12.	A = 40, b = 7, c = 6.8	Find a, B and C.
13.	A = 40, b = 7, a = 6.2	Find c, B and C.
14.	a = 4, b = 7, c = 6.8	Find A, B and C.
15.	$T = \frac{d}{e-f} + g$	Transpose the T-formula to a d-, e-, f-, and g-formula
16.	The capital 785 increased with 2.7% 5 times and became ?	Find the answer Find the corresponding doubling time.
17.	The capital 785 increased with 2.7% ? times and became 980	Find the answer Find the corresponding doubling time.
18.	The capital 785 increased with ?% 5 times and became 980	Find the answer Find the corresponding doubling time.
19.	-21	As 16-18, but with $ instead of %

Problem 1. Linear model

Equation:	y=ax+b
	y=x+9, found by Stat, Calc, LinReg
Test	y1(3) = 12 ☺

y=?	y=x+9
x=10	y=19 found by y1(10)
Test	y=19 found by CalcValue ☺

x=?	y=x+9
y=40	x=31, found by Math, Solver 0=y1-40
Test	y1(31) = 40 ☺

Exponential model

Equation:	y=a*b^x
	y=9.671*1.075^x, found by Stat, Calc, ExpReg
Test	y1(3) = 12 ☺

y=?	y=9.671*1.075^x
x=10	y=19.853 found by y1(10)
Test	y=19.853 found by CalcValue ☺

x=?	y=9.671*1.075^x
y=40	x=19.740, found by Math, Solver 0=y1-40
Test	y1(19.740) = 40 ☺

Doubling time T = log2/logb = log2/log1.075 = 9.6

Power model

Equation:	y=a*x^b
	y=8.264*x^0.340 found by Stat, Calc, PwrReg
Test	y1(3) = 12 ☺

y=?	y=8.264*x^0.340
x=10	y=18.060 found by y1(10)
Test	y=18.060 found by CalcValue ☺

x=?	y=8.264*x^0.340
y=40	x=104.024 found by Math, Solver 0=y1-40
Test	y1(104.024) = 40 ☺

Problem 2. Quadratic model

Equation:	y=a*x^2+b*x+c
	y=-0.048x^2+1.476x+8 found by Stat, Calc, QuadReg
Test	y1(3) = 12 ☺

y=?	y=-0.048x^2+1.476x+8
x=15	y=19.429 found by y1(15)
Test	y=19.429 found by Graph, Calc, Value ☺

x=?	y=-0.048x^2+1.476x+8
y=10	x=1.420 or 29.580 found by Math, Solver 0=y1-10
Test	y1(1.420) = 10 y1(29.580) = 10 ☺

Maximum:	y=-0.048x^2+1.476x+8
	(x,y) = (15.500,19.140) found by Graph, Calc, Maximum
Test	dy/dx = 0 for x = 15.5 y1(15.5)= 19.14 ☺

Tangent in x=2	y=-0.048x^2+1.476x+8
x=2	y=1.286x + 8.190 found by Graph, Draw, Tangent

Gradient formula	y=-0.048x^2+1.476x+8
	y'= -0.095*x + 1.476, found by TI89
Test	∫y'dx=-0.048x^2+1.476x found by TI89 ☺

Gradient number:	y=-0.048x^2+1.476x+8
x=5	dy/dx = 1 for x=5 found by Graph, Calc, dy/dx
Test	1, found by Math, nDeriv ☺

Area formula:	y=-0.048x^2+1.476x+8
x=2	∫ydx = -0.016*x^3 + 0.738*x^2 + 8.000*x found by TI89
Test	d(∫ydx)/dx = -0.048x^2+1.476x+8 found by TI89 ☺

Area number:	y=-0.048x^2+1.476x+8
	$\int_1^6 y\,dx$ = 62.421, found by Graph, Calc, ∫f(x)dx
Test	62.421, found by Math, fnInt ☺

Intersection points	y = -0.048x^2+1.476x+8 and y = 3+2x (y1 = y3)
	(x,y) = (-17.130,-31.260) and (x,y) = (6.130, 15. 260), found by Math, Solver 0=y1-y3 and y1(-17.130) = -31.260 etc.
Test	tested by Graph, Calc, Intersect ☺

Problem 3. Cubic model

Equation:	y=a*x^3+b*x^2+c*x+d
	y=0.086x^3-1.952x^2+13.752x-14, found by Stat, Calc, CubicReg
Test	y1(3) = 12 ☺

y=?	y=0.086x^3-1.952x^2+13.752x-14
x=15	y=42.286 found by y(15)
Test	y=42.286 found by Graph, Calc, Value ☺

x=?	y=0.086x^3-1.952x^2+13.752x-14
y=30	x=13.885 found by Math, Solver 0=y1-30
Test	y1(13.885) = 30 ☺

Maximum Minimum:	y=0.086x^3-1.952x^2+13.752x-14
	Max: (x,y) = (5.552, 16.841) found by Graph, Calc, Maximum Min: (x,y) = (9.634, 13.925) found by Graph, Calc, Minimum
Test	dy/dx = 0 for x = 5.552 y1(5.552)= 16.841 dy/dx = 0 for x = 9.643 y1(9.643)= 13.925 ☺

Tangent in x=2	y=0.086x^3-1.952x^2+13.752x-14
x=2	y = 6.971x – 7.562 found by Graph, Draw, Tangent

Gradient formula	y=0.086x^3-1.952x^2+13.752x-14
	y'= 0.257*x^2 – 3.905*x + 13.752, found by TI89
Test	∫y'dx=0.086x^3-1.952x^2+13.752x found by TI89 ☺

Allan.Tarp@MATHeCADEMY.net

Gradient number:	y=0.086x^3-1.952x^2+13.752x-14
x=5	y'(5) = 0.657 found by Graph, Calc, dy/dx
Test	0.657, 1 found by Math, nDeriv ☺

Area formula:	y=0.086x^3-1.952x^2+13.752x-14
x=2	$\int ydx$ = 0.021*x^4 – 0.651*x^3+6.876*x^2+14*x found by TI89
Test	d(∫ydx)/dx = 0.086x^3-1.952x^2+13.752x-14 found by TI89 ☺

Area number:	y=0.086x^3-1.952x^2+13.752x-14
	$\int_1^6 ydx$ = 58.496, found by Graph, Calc, ∫f(x)dx
Test	58.496, 62.421 found by Math, fnInt ☺

Intersection points with y=3+2x: (x,y) = (2.129,-7.259) and (x,y) = (6.657, 16.315) and (x,y) = (13.991, 30.981) found by Math, Solver 0=y1-y3 , tested by Graph, Calc, Intersect.

Problem 4

Solutions: $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3.632 \\ 1.027 \end{pmatrix}$, found by A*B=C, B=A^-1*C, where A = $\begin{pmatrix} 3 & 4 \\ 5 & -6 \end{pmatrix}$ and B = $\begin{pmatrix} x \\ y \end{pmatrix}$ and C = $\begin{pmatrix} 15 \\ 12 \end{pmatrix}$

Tested by A*B=C : A*B = $\begin{pmatrix} 3 & 4 \\ 5 & -6 \end{pmatrix} * \begin{pmatrix} 3.632 \\ 1.027 \end{pmatrix} = \begin{pmatrix} 15 \\ 12 \end{pmatrix}$ = C ☺

Problem 5

Midpoint:	$(x,y) = (\frac{x1+x2}{2}, \frac{y1+y2}{2})$
x1=2 x2=6 y1=4 y2=10	$(x,y) = (\frac{2+6}{2}, \frac{4+10}{2})$ (x,y) = (4,7)
Test	Tested geometrically ☺

Gradient PQ:	$a = \frac{y2-y1}{x2-x1}$
x1=2 x2=6 y1=4 y2=10	$a = \frac{10-4}{6-2}$ a= 3/2 a = 1.5
Test	Tested geometrically ☺

Line PQ:	y = y1 + a*(x – x1)
a =1.5 x1=2 y1=4	y = 4 + 1.5*(x – 2) y = 1.5*x + 1
Test	Tested geometrically ☺

Gradient perpend.:	c*a = -1
a=3/2	c = -2/3 found by Math, Solver 0 = c*3/2+1
Test	Tested geometrically ☺

Normal:	y = y1 + a*(x – x1)
a=-2/3 x1=2 y1=4	y = 4 + -2/3*(x – 2) y = -2/3*x + 5.333
Test	Tested geometrically ☺

Distance PQ	$d = \sqrt{(x2-x1)^2 + (y2-y1)^2}$
x1=2 x2=6 y1=4 y2=10	$d = \sqrt{(6-2)^2 + (10-4)^2}$ d = 7.21
Test	Tested geometrically ☺

Distance point-line	$d = \frac{\lvert y1 - a*x1 - b \rvert}{\sqrt{1 + a^2}}$
a=1.5 b=1 x1=8 y1=1	$d = \frac{\lvert 1 - 1.5*8 - 1 \rvert}{\sqrt{1 + 1.5^2}}$ d = 6.66
Test	Tested geometrically ☺

Circle equation	$(x-c1)^2 + (y - c2)^2 = r^2$
r=½*7.21 r=3.61 c1=4 c2=7	$(x -4)^2+(y - 7)^2 = 3.61^2$ $(x -4)^2+(y - 7)^2 = 13.03$
Test	Tested geometrically ☺

Intersection	$(x-c1)^2 + (y - c2)^2 = r^2$ and y = 12-2x
r =½*7.21 =3.61 c1 =4 c2 =7	(x,y) = (1.30,9.40) and (4.30,3.40) found by Math, Solver 0 = $(x-4)^2 + (12-2x-7)^2 – 3.61^2$
Test	Tested geometrically ☺

Angle: tan(v) = a, a=3/2 ; v = 56.31 found by Math, Solver 0 = tanv - 3/2, v>0 and v<90. Tested geometrically ☺

Problem 6

p(X<115) = 0.894, found by normalCdf(1EE-99,115,100,12)
p(X<89) = 0.180, found by normalCdf(1EE-99,89,100,12)
p(X>108) = 0.253, found by normalCdf(108,1EE99,100,12)
p(93<X<109) = 0.494, found by normalCdf(93,109,100,12)

Problem 7

p(X<70) = 0.827, found by binomCdf(100,0.65,0,69)
p(X≤60) = 0.172, found by binomCdf(100,0.65,0,60)
p(X≥58) = 0.941, found by binomCdf(100,0.65,58,100)
p(63<X≤72) = 0.571, found by binomCdf(100,0.65,64,72)

Problem 8

x=?	Sin(3x) = 0.4
	x =0.137, or 0.910, or 2.232 or 3.004 or 4.326 or 5.099 found by Math, Solver 0=y1-0.4
Test	tested by Graph, Calc, Intersect ☺

x=?	cos(½x) = -0.3
	x =3.745 found by Math, Solver 0=y1+0.3
Test	tested by Graph, Calc, Intersect ☺

x=?	tan(2x) = 0.7
	x =0.305, or 1.876, or 3.447 or 5.018 found by Math, Solver 0=y1-0.7
Test	tested by Graph, Calc, Intersect ☺

Problem 9

a = ?	tan A = a/b
A =40 b=7	a = 5.874 found by Math, Solver 0=a/7-tan40
Test	tan40 = 5.874/7 0.839 = 0.839 ☺

c = ?	cos A = b/c
A =40 b=7	c = 9.138 found by Math, Solver 0=7/c-cos40
Test	cos40 = 7/9.138 0.766 = 0.766 ☺

B = ?	A + B = 90
A = 40	B = 50 found by Math, Solver 0=40+B-90
Test	50+40 = 90 90 = 90 ☺

Problem 10

b = ?	a^2 + b^2 = c^2
a =4	b = 5.745
c=7	found by Math, Solver
	0=4^2+b^2-7^2
Test	4^2 + 5.745^2 = 7^2
	49 = 49 ☺

A = ?	sinA = a/c
a =4	A =34.85
c=7	found by Math, Solver
	0=4^2+b^2-7^2
Test	Sin34.85 = 4/7
	0.571 = 0.571 ☺

B = ?	A + B = 90
A =	B = 55.15
34.85	found by Math, Solver
	0=34.85+B-90
Test	34.85+55.15 = 90
	90 = 90 ☺

Problem 11

B = ?	A+B+C=180
A =40	B = 72
C =68	found by Math, Solver
	0=40+B+68-180
Test	40+72+68=180
	180= 180 ☺

a = ?	a/sinA = b/sinB
A =40	a =4.731
B =72	found by Math, Solver
b = 7	0=a/sin40- 7/sin72
Test	4.731/sin40 = 7/sin72
	7.360 = 7.360 ☺

c = ?	c/sinC = b/sinB
C =68	c =6.824
B =72	Math, Solver
b = 7	0=c/sin68 - 7/sin72
Test	6.824/sin68 = 7/sin72
	7.360 = 7.360 ☺

Problem 12

a = ?	$a^2 = c^2+b^2-2*c*b*\cos A$
A =40	a =4.724
c =6.8	found by Math, Solver
b = 7	$0=a^2-6.8^2-7^2+2*6.8*7*\cos 40$
Test	$4.724^2=6.8^2+7^2-2*6.8*7*\cos 40$
	22.316= 22.316 ☺

B = ?	a/sinA = b/sinB
A =40	B = 72.3
b = 7	found by Math, Solver
a=4.724	0=4.724/sin40- 7/sinB
Test	4.724/sin40 = 7/sin72.3
	7.348 = 7.348 ☺

C = ?	A+B+C=180
A =40	C = 67.7
B =72.3	found by Math, Solver
	0 = 40+72.3+C-180
Test	40+72.3+67.7=180
	180= 180 ☺

Problem 13

B = ?	a/sinA = b/sinB
A =40	B =46.53 or B = 133.47
a =6.2	found by Math, Solver
b = 7	0 = 6.2/sin40 - 7/sinB, B>0
	and B< 180
Test	6.2/sin40=7/sin46.53=7/sin133.47
	9.645 = 9.645 = 9.645 ☺

C = ?	A+B+C=180
A =40	C = 93.47or C = 6.53
B =46.53	found by
or	Math, Solver
B=133.47	0 = 40+B+C-180
Test	40+46.53+93.47=180
	180= 180 ☺

c = ?	a/sinA = c/sinC
A =40	c = 9.628 or C = 1.097
a=6.2	found by Math, Solver
C =93.47,	0 = 6.2/sin40 - c/sinC
C=6.53	
Test	6.2/sin40=9.628 /sin93.47=9.628 /sin6.53
	9.645 = 9.645 = 9.645 ☺

Problem 14

A = ?	$a^2 = c^2+b^2-2*c*b*\cos A$
a = 4	A =33.66
c =6.8	found by Math, Solver
b = 7	$0 = 4^2-6.8^2-7^2+2*6.8*7*\cos A$
Test	$4^2 =6.8^2+7^2-2*6.8*7*\cos 33.66$
	16 = 16 ☺

B = ?	$b^2 = a^2+c^2-2*a*c*\cos B$
a = 4	B =75.91
c = 6.8	found by Math, Solver
b = 7	$0 = 7^2-4^2-6.8^2+2*6.8*4*\cos B$
Test	$7^2=4^2+6.8^2-2*6.8*4*\cos 75.91$
	49 = 49 ☺

C = ?	A+B+C=180
A =33.66	C = 70.43
B =75.91	found by Math, Solver
	0 = 33.66+75.91+C-180
Test	33.66+75.91+70.43=180
	180= 180 ☺

Problem 15

d=?	$T = \frac{d}{e-f} + g$
	$T = (\frac{d}{(e-f)}) + g$
	$d = (e-f)*(T-g)$
Test	$T= \frac{(e-f)*(T-g)}{e-f} +g = T$

e=?	$T = \frac{d}{e-f} + g$
	$T = (\frac{d}{(e-f)}) + g$
	$(T-g)(e-f) = d$
	$e = \frac{d}{T-g} + f$
Test	$T= \frac{d}{\frac{d}{T-g} + f -f} +g =T$

f=?	$T = (\frac{d}{(e-f)}) + g$
	$(T-g)(e-f) = d$
	$e = \frac{d}{T-g} + f$
	$e - \frac{d}{T-g} = f$
Test	$T= \frac{d}{e- e - \frac{d}{T-g}} +g =T$

g=?	$T = \frac{d}{e-f} + g$
	$T = (\frac{d}{(e-f)}) + g$
	$T - (\frac{d}{(e-f)}) = g$
Test	$T= \frac{d}{e-f} +T - (\frac{d}{(e-f)})=T$

Problems 16-18

y = ?	y = a*b^x
a=785	y = 785*1.027^5
b=1.027	y = 896.85
x=5	

T = ln(2)/ln(1.027) = 26.0

x = ?	y = a*b^x
a=785	x = 8.3
b=1.027	found by Math, Solver
y=980	0=785* 1.027^x - 980
Test	980 = 785*1.027^8.3
	980 = 980 ☺

T = ln(2)/ln(1.027) = 26.0

b = ?	y = a*b^x
a=785	b = 1.045 = 1 + 4.5%
y=980	found by Math, Solver
x=5	0=785*b^5 - 980
Test	980 = 785*1.045^5
	980 = 980 ☺

T = ln(2)/ln(1.045) = 15.7

Problems 19-21

y = ?	y = a* x + b
b=785	y = 2.7*5 + 785
a= 2.7	y = 798.5
x=5	

x = ?	y = a* x + b
b=785	x = 72.2
a= 2.7	found by Math, Solver
y=980	0 = 2.7* x+785 - 980
Test	980 = 2.7*72.2 + 785 = 980 ☺

a = ?	y = a* x + b
b=785	a = 39
y=980	found by Math, Solver
x=5	0 = a*5+785 - 980
Test	980 = 39*5 + 785 = 980 ☺