GROUP NAME:

|  |
| --- |
|  |

MEMBERS:

Data points:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| X: |  |  |  |  |  |  |
| Y: |  |  |  |  |  |  |

Description of X values:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Units:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Description of Y values:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Units:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Source of the data: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Why it is interesting:

|  |
| --- |
|  |

ALL regressions calculated:

LinReg: a=\_\_\_\_\_ b=\_\_\_\_\_\_ r2=\_\_\_\_\_\_\_

QuadReg: a=\_\_\_\_\_ b=\_\_\_\_\_\_ c=\_\_\_\_\_\_\_ r2=\_\_\_\_\_\_\_

CubicReg: a=\_\_\_\_\_ b=\_\_\_\_\_\_ c=\_\_\_\_\_ d=\_\_\_\_\_\_ r2=\_\_\_\_\_\_\_

QuartReg: a=\_\_\_\_\_ b=\_\_\_\_\_\_ c=\_\_\_\_\_ d=\_\_\_\_\_\_ e=\_\_\_\_\_ r2=\_\_\_\_\_\_\_

ExpReg: a=\_\_\_\_\_ b=\_\_\_\_\_\_ r2=\_\_\_\_\_\_\_

LnReg: a=\_\_\_\_\_ b=\_\_\_\_\_\_ r2=\_\_\_\_\_\_\_

SinReg\*: a=\_\_\_\_\_ b=\_\_\_\_\_\_ c=\_\_\_\_\_ d=\_\_\_\_\_\_\_

\*sin regression has a period of \_\_\_\_\_\_\_\_\_\_\_

Calculated with SinReg 1,L1,L2,# (where # is twice the distance from largest to smallest x value.)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Prof. Porter | Mercer County College | Spr 2017 | REGRESSION PROJECT WORK SHEET | GROUPS |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Plot of data and regression.  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | | Regression used: |  | | First x (a) |  | | Last x (b) |  |   Average rate of change between the first and last x-values using regression   |  |  |  | | --- | --- | --- | | {Y(b)-Y(a)}/{b - a} | Average Rate of Change |  |   Meaning: |
| 1. The graph split into two regions with two different regressions on each side.  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | | left regression split at a  Y1=vars 5: > > 1: RegEq /(x≤a)  right regression  Y2=vars 5: > > 1: RegEq /(x≥a) | Left Regression used: |  | | Right Regression used: |  | | Location of split (a) |  | | Find Y1(a)  Y2(a) |  |  | |  |  |   Meaning:   1. The graph split into two regions with two different regressions on each side.  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | | left regression split at a  Y1=vars 5: > > 1: RegEq /(x≤a)  right regression  Y2=vars 5: > > 1: RegEq /(x≥a) | Left Regression used: |  | | Right Regression used: |  | | Find Y1(-9999)  Y2(9999) |  |  | |  |  |   Meaning: |
| 1. Using the derivative to find the equation of the tangent line at a point  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Y1=regression  Y2=nderiv(y1,x,x)  Table values:   |  |  |  | | --- | --- | --- | | a= | y1 | y2 |   Y3=y1+y2(x-a) | Regression: |  | | Given a= |  | | Equation of Tangent Line: |  |   Meaning: |
| 1. The graph split into two regions with two different regressions on each side.  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | | left regression split at a  Y1=vars 5: > > 1: RegEq /(x≤a) + adjust  right regression  Y2=vars 5: > > 1: RegEq /(x≥a) + adjust | Left Regression used: |  | | Right Regression used: |  | | Location of split (a) |  | | Find Y1(a)  Y2(a) |  |  |   Meaning: |
| 1. For a continuous regression: Given ɛ = small number Find δ > 0 that satisfies   Roughly adjust the regressions so the graph is continuous.  Plot data and graph the regressions. Label Axis.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | | Y1(x)=regression (y2=split regression)  Y3=L- ɛ  Y4=L+ ɛ  Calc 5:intersect y1 and y3 = x1  Calc 5:intersect y1(2) and y4 = x2  δ = maximum(|a-x1|,|a- x2|) | =L |  | | Given ɛ = |  | | Find δ = |  |   Meaning: |
| 1. Roughly plot data and regression. Draw the secant and tangent lines at x = a Label Axis.  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | Pick x values in order   |  |  | | --- | --- | | X1= |  | | X2= |  | | X3= |  | | a= |  | | X4= |  | | X5= |  | | X6= |  | | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |   Find the average rate of change between the exterior x-values around x = a using regression   |  |  |  | | --- | --- | --- | | {Y(x1) - Y(x6)}/{x1 – x6}= msec | Average Rate of Change |  |   Find the average rate of change between an interior x-values around x = a using regression   |  |  |  | | --- | --- | --- | | {Y(x2) - Y(x5)}/{x2 – x5}= msec | Average Rate of Change |  |   Find the average rate of change between the more interior x-values around x = a using regression   |  |  |  | | --- | --- | --- | | {Y(x3) - Y(x4)}/{x3 – x4}= msec | Average Rate of Change |  |   Find the instnataneous rate of change at x = a   |  |  |  | | --- | --- | --- | | nderiv(y1,x,a) | Instant Rate of Change |  |   Meaning: |
| 1. Find the derivatives of different regressions using rules at x = x1  |  |  |  | | --- | --- | --- | | Linear Regression y1=ax+b | y’= a | y’(x1) = | | Quadratic Regression y2=ax2+bx+c | y’= 2ax+b | y’(x1) = | | Cubic Regression y3=ax3+bx2+cx+d | y’= 3ax2+2bx+c | y’(x1) = | | Quartic Regression y4=ax4+bx3+cx2+dx+e | y’=4ax3+3bx2+2cx+d | y’(x1) = |     Compaire to y5 = nderv(y4,x,x) at x = x2, x3, x4   |  |  | | --- | --- | | X2= | y4’(x2) = | | X3= | y4’(x3) = | | X4= | y4’(x4) = | |
| 1. Find the derivatives of different regressions using rules at x = x1  |  |  |  | | --- | --- | --- | | Exponential y6=a\*b^x | y’= a\*b^x\*ln(b) | y’(x1) = | | Ln Regression y7=alnx+b | y’= a/x | y’(x1) = |   Compaire to y8 = nderv(y6,x,x) at x = x2, x3, x4   |  |  | | --- | --- | | X2= | y8’(x2) = | | X3= | y8’(x3) = | | X4= | y8’(x4) = | |
| 1. .Find the second derivatives of different regressions using rules at x = x1  |  |  |  | | --- | --- | --- | | Linear Regression y1=ax+b | y’’= 0 | y’’(x1) = | | Quadratic Regression y2=ax2+bx+c | y’’= 2a | y’’(x1) = | | Cubic Regression y3=ax3+bx2+cx+d | y’’= 6ax+2b | y’’(x1) = | | Quartic Regression y4=ax4+bx3+cx2+dx+e | y’’=12ax2+6bx+2c | y’’(x1) = |   Compaire to y5 = nderv(nderiv(y4,x,x),x,x) at x = x2, x3, x4   |  |  | | --- | --- | | X2= | y4’’(x2) = | | X3= | y4’’(x3) = | | X4= | y4’’(x4) = | |
| 1. Make a transformation of your x-values and your y-values  |  |  |  | | --- | --- | --- | | New x-values (units) | Old x-values(units) | Y1= | |  |  |  | | Old x-values(units) | Old y-values(units) | Y2(regression)= | |  |  |  | | Old y-values(units) | New y-values(units) | Y3= | |  |  |  |  |  |  |  | | --- | --- | --- | | Example: cm to inches y1=x/2.54  Inches to lbs y2=linreg  Lbs to kg y3=x/2.2  Y4’(A)=  nderiv(y3,x,(y2,x,(y1,x,A)))\*nderiv,(y2,x,(y1,x,A))\* nderiv(y1,x,A) | Regression used: |  | | New x-value(A) |  | | Y4’(A) |  | | units |  |   Meaning: |
| 1. Find the derivatives of sine regression using rules at x = x1      |  |  |  | | --- | --- | --- | | Sine Regression y2=asin(bx+c)+d | y’= acos(bx+c)\*b | y’(x1) = |   Find the second derivatives of sine regression using rules at x = x1   |  |  |  | | --- | --- | --- | | Sine Regression y2=asin(bx+c)+d | y’’= -asin(bx+c)\*b^2 | y’’(x1) = |   Find the third derivatives of sine regression using rules at x = x1   |  |  |  | | --- | --- | --- | | Sine Regression y2=asin(bx+c)+d | y’’’= acos(bx+c)\*b | y’’’(x1) = |   Meaning: |
| 1. Find the derivatives of the inverse sine regression using rules at y = y1      |  |  |  | | --- | --- | --- | | Sine Regression y2=asin(bx+c)+d | X=(sin-1((y-d)/a))/b-c | x’(y1) = | |  | X’=1/(1-((y-d)/a)^2)^.5/b |  | |
| 1. Use the mean value theorem on the two end points OF a regression and identify a point on the graph with a similar slope?  |  |  |  | | --- | --- | --- | | Y1=regEq  Y2=nderiv(y1,x,x)  Y3=”average rate of change”  Calc 5:intersect | Regression used: |  | | Ave Rate of change: |  | | Point(s) of intersection: |  |   Meaning: |
| 1. Was the zero found by using Newton’s Method for by using x=0 or x=1 as an initial guess?   Y1=cubicregression  0 sto x  x-y1/nderv(y1,x,x)stox  iteration\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  iteration\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  iteration\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  zero:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Meaning: |
| 1. Related rates   Rate at which x is changing:  Regression used:  Rate at which y is changing:  Meaning: |
| 1. Graph of a complex regression with all critical points, concavity, and inflection points.  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | X: |  |  |  |  |  |  |  |  |  | | Y’ |  |  |  |  |  |  |  |  |  | | Increasing or Deceasing |  |  |  |  |  |  |  |  |  | | Y’’ |  |  |  |  |  |  |  |  |  | | Concavity?  Up or Down |  |  |  |  |  |  |  |  |  |   Meaning:   1. Using y’=0 to identify critical values a1,a2  |  |  | | --- | --- | | Critical Points |  |   Using y’’(a1) and y”(a2) to determine max/min   |  |  | | --- | --- | | Y’’ at critical Points |  | | Max or Min |  |  1. Using y’’=0 to identify inflection points Y’’=0 at –b/(6a):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  |  |  | | --- | --- | | Inflection Points |  | |
| 1. Optimization |
| 1. Error for all the regressions:   Using differentials to identify the error in a prediction?  Y1= regression or derivative  dx=error in measuring x value (±.5\*last sig fig)  error ~f’(a)dx  Meaning: |
| 1. The area under the best regression and between the first and last values found using calculator and the Fundamental Theorem?  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |   Calc 7: lower\_\_\_\_\_\_ Upper:\_\_\_\_\_\_\_\_  Regression f(x):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Antiderivative: F(x):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  F(upper)-F(lower):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Meaning: |
| 1. The area under the best regression and between the first and last values approximated using left and right endpoint rectangles?  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | X: |  |  |  |  |  |  | | Y: |  |  |  |  |  |  |   Sum of 8 rectangles left endpoints:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Right endpoints:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Meaning: |
| 1. Were the units identified for the area under the curve?   Units (y) \* Units (x) =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Was the average value given?  Area (from 15) divided by (last x-first x):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Meaning: |