GROUP NAME:

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MEMBERS:

Data points:

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

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

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

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

Why it is interesting:

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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.)

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

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| 1. Plot of data and regression.

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| Regression used: |  |
| First x (a) |  |
| Last x (b) |  |

 Average rate of change between the first and last x-values using regression

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| {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.

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|  left regression split at aY1=vars 5: > > 1: RegEq /(x≤a) right regressionY2=vars 5: > > 1: RegEq /(x≥a) | Left Regression used: |  |
| Right Regression used: |  |
| Location of split (a) |  |
|  Find Y1(a) Y2(a) |  |  |
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Meaning:1. The graph split into two regions with two different regressions on each side.

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|  left regression split at aY1=vars 5: > > 1: RegEq /(x≤a) right regressionY2=vars 5: > > 1: RegEq /(x≥a) | Left Regression used: |  |
| Right Regression used: |  |
|  Find Y1(-9999) Y2(9999) |  |  |
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Meaning: |
| 1. Using the derivative to find the equation of the tangent line at a point

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| Y1=regressionY2=nderiv(y1,x,x)Table values:

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| 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.

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|  left regression split at aY1=vars 5: > > 1: RegEq /(x≤a) + adjustright regressionY2=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.

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| Y1(x)=regression (y2=split regression)Y3=L- ɛY4=L+ ɛCalc 5:intersect y1 and y3 = x1Calc 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.

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|  |  |  |  |  |  |  |  |  |  | Pick x values in order

|  |  |
| --- | --- |
| X1= |  |
| X2= |  |
| X3= |  |
| a= |  |
| X4= |  |
| X5= |  |
| X6= |  |

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 Find the average rate of change between the exterior x-values around x = a using regression

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| --- | --- | --- |
| {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

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| --- | --- | --- |
| 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

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| --- | --- | --- |
| 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= |
|  |  |  |

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| --- | --- | --- |
| Example: cm to inches y1=x/2.54 Inches to lbs y2=linreg Lbs to kg y3=x/2.2Y4’(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

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| --- | --- | --- |
| 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

|  |  |  |
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| 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

|  |  |  |
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| 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

|  |  |  |
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| 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=regEqY2=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=cubicregression0 sto xx-y1/nderv(y1,x,x)stoxiteration\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_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.

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| X: |  |  |  |  |  |  |  |  |  |
| Y’ |  |  |  |  |  |  |  |  |  |
| Increasing or Deceasing |  |  |  |  |  |  |  |  |  |
| Y’’ |  |  |  |  |  |  |  |  |  |
| Concavity?Up or Down |  |  |  |  |  |  |  |  |  |

Meaning:1. Using y’=0 to identify critical values a1,a2

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| Critical Points |  |

 Using y’’(a1) and y”(a2) to determine max/min

|  |  |
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| Y’’ at critical Points |  |
| Max or Min |  |

1. Using y’’=0 to identify inflection points Y’’=0 at –b/(6a):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| Inflection Points |  |

 |
| 1. Optimization
 |
| 1. Error for all the regressions:

Using differentials to identify the error in a prediction?Y1= regression or derivativedx=error in measuring x value (±.5\*last sig fig)error ~f’(a)dxMeaning: |
| 1. The area under the best regression and between the first and last values found using calculator and the Fundamental Theorem?

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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?

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| 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:  |