Name _____ Score _____ Teacher _____ Date _____

Least-Squares Curve Models

Use every printed data value and supplied model. Compare models by SSE, not by visual preference alone.

1. **Is the model yhat=a+b sin(x)+c x^2 linear in its unknown coefficients? Explain what that means for least squares.**

Reference: A model is linear in coefficients when each unknown coefficient multiplies a known function of x and coefficients are not multiplied together or placed inside nonlinear functions.

2. **For data (-2, 15), (-1, 5), (0, 3), (1, 9), (2, 23), form and solve the normal equations for the least-squares quadratic yhat=a+bx+cx^2.**

Reference: Compute sums n, sum x, sum x^2, sum x^3, sum x^4, sum y, sum xy, and sum x^2y. The equations are [n,sum x,sum x^2; sum x,sum x^2,sum x^3; sum x^2,sum x^3,sum x^4][a,b,c]^T=[sum y,sum xy,sum x^2y]^T.

Show substitutions and residual signs; use only printed values.

Name _____ Score _____ Teacher _____ Date _____

Least-Squares Curve Models

Use every printed data value and supplied model. Compare models by SSE, not by visual preference alone.

3. **For an exponential model y=A exp(kx), the supplied transformed data (x, ln y) are (0, 0.45), (1, 0.75), (2, 1.05), (3, 1.35), (4, 1.65). Fit the least-squares line ln y=alpha+kx, then give A and k.**

Reference: Use only the printed ln y values. Fit a line to (x,ln y); then A=exp(alpha). Report A to three decimals.

4. **For data (-2, 8), (-1, 6), (0, 4), (1, 6), (2, 8), evaluate SSE for L(x)=4+0.5x, Q(x)=4+x^2, and C(x)=4-0.25x+x^2+0.1x^3. Which supplied model has the smallest SSE?**

Reference: For each row compute residual y-yhat, square it, then sum. SSE=sum(y-yhat)^2. Use the printed coefficients exactly.

Show substitutions and residual signs; use only printed values.

Name _____ Score _____ Teacher _____ Date _____

Least-Squares Curve Models

Use every printed data value and supplied model. Compare models by SSE, not by visual preference alone.

5. **For an exponential model y=A exp(kx), the supplied transformed data (x, ln y) are (0, 0.55), (1, 0.75), (2, 0.95), (3, 1.15), (4, 1.35). Fit the least-squares line ln y=alpha+kx, then give A and k.**

Reference: Use only the printed ln y values. Fit a line to (x,ln y); then A=exp(alpha). Report A to three decimals.

6. **Is the model yhat=a+b x+c cos(x) linear in its unknown coefficients? Explain what that means for least squares.**

Reference: A model is linear in coefficients when each unknown coefficient multiplies a known function of x and coefficients are not multiplied together or placed inside nonlinear functions.

Name _____ Score _____ Teacher _____ Date _____

Least-Squares Curve Models

Use every printed data value and supplied model. Compare models by SSE, not by visual preference alone.

7. **For data (-2, 17), (-1, 4), (0, 1), (1, 8), (2, 25), form and solve the normal equations for the least-squares quadratic yhat=a+bx+cx^2.**

Reference: Compute sums n, sum x, sum x^2, sum x^3, sum x^4, sum y, sum xy, and sum x^2y. The equations are [n,sum x,sum x^2; sum x,sum x^2,sum x^3; sum x^2,sum x^3,sum x^4][a,b,c]^T=[sum y,sum xy,sum x^2y]^T.

8. **For data (-2, 13), (-1, 9), (0, 9), (1, 9), (2, 13), evaluate SSE for L(x)=8+0.5x, Q(x)=8+x^2, and C(x)=8-0.25x+x^2+0.1x^3. Which supplied model has the smallest SSE?**

Reference: For each row compute residual y-yhat, square it, then sum. SSE=sum(y-yhat)^2. Use the printed coefficients exactly.

Show substitutions and residual signs; use only printed values.