Dependencies

In [7]:
```
using Interact
using Gadfly
using CSV
```

In [2]:
```
set_default_plot_size(20cm, 20cm)
```

Functions

In [3]:
```
function Plot_estimates(x, y, xaxis, yaxis)
    X = [ones(x) x]
    β = inv(transpose(X)*X)*transpose(X)*y
    SST = sum(transpose(y-mean(y))*(y-mean(y)))
    SSE = sum(transpose(X*β-mean(y))*(X*β-mean(y)))
    SSR = sum(transpose(y-X*β)*(y-X*β))
    R_squared = SSE/SST
    p = plot(
            layer(x = x, y = y, Geom.point),
            layer(x = x, y = X*β, Geom.line),
            Guide.xlabel(xaxis),
            Guide.ylabel(yaxis),
            Guide.title(join(["(β0, β1) = (", string(round(β[1], 2)), ", ", string(round(β[2],
            )
    return p
end
```

Out[3]: Plot_estimates (generic function with 1 method)

In [4]:
```
function Model_Regression(x_values, y_values)

    # Plots
    plot_linlin = Plot_estimates(x_values, y_values, "x", "y")
    plot_linlog = Plot_estimates(x_values, log.(y_values), "x", "log(y)")
    plot_loglin = Plot_estimates(log.(x_values), y_values, "log(x)", "y")
    plot_loglog = Plot_estimates(log.(x_values), log.(y_values), "log(x)", "log(y)")

    title(gridstack([plot_linlin plot_linlog; plot_loglin plot_loglog]), "Regression Plots")

end
```

Out[4]: Model_Regression (generic function with 1 method)

Engel Example

In [5]:
```
# y
dairy = [8.87, 6.59, 11.46, 15.07, 15.6, 6.71, 10.02, 7.41, 11.52, 7.47, 6.73, 8.05, 11.03, 10
# x
inc_per_capita = [1250, 985, 2175, 1025, 1690, 670, 1600, 940, 1730, 640, 860, 960, 1575, 1230
```

Problem:

$$\hat{\mathbf{y}} = \hat{\beta_0} + \hat{\beta_1} \cdot x = \mathbf{X}\hat{\beta}$$

With:

$$\hat{\beta} = (\mathbf{X}^T\mathbf{X})^{-1}\mathbf{X}^T\mathbf{y}$$

Where:

$$\mathbf{X} = \begin{bmatrix} 1 & incpercapita_1 \\ \dots & \dots \\ 1 & incpercapita_n \end{bmatrix}$$

In [6]:
```
Model_Regression(inc_per_capita, dairy)
```

Out[6]: