In [132]:
```
using Interact
using Gadfly
using Interpolations
```

In [210]:
```
set_default_plot_size(25cm,10cm)
```

Chapter2 - Curve Fitting and Function Approximation

1. Interpolation

Exercise 4.

Access Table 1 from [http://www.bls.gov/cps/cpswom2007.pdf (http://www.bls.gov/cps/cpswom2007.pdf)](http://www.bls.gov/cps/cpswom2007.pdf) where you can find weekly median wages by age group. Plot the data points and compute the linear interpolation and extrapolation for ages 16 to 90 years old. For extrapo- lation, use the linear interpolation of adjacent interval. Normalize the wages to the first interpolated value.

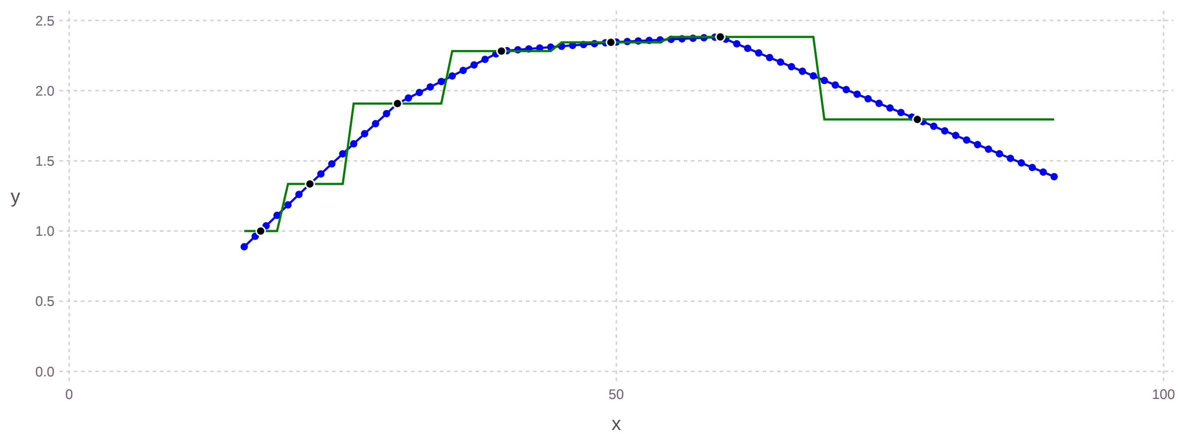
In [193]:
```
Table1 = ["bracket_16t19" 337; "bracket_20t24" 450; "bracket_25t34" 643; "bra
```

Out[193]:
```
7×2 Array{Any,2}:
 "bracket_16t19"   337
 "bracket_20t24"   450
 "bracket_25t34"   643
 "bracket_35t44"   769
 "bracket_45t54"   790
 "bracket_55t64"   803
 "bracket_65plus"  605
```

In [222]:
```
function ex4_LinearInterpolation()

    agebrackets = [16+19;20+24;25+35;35+44;45+54;55+64;65+90]*.5
    wageprofile = Table1[:,2]/Table1[1,2];

    itp_const = interpolate((agebrackets, ), wageprofile, Gridded(Constant()))
    itp_linear = interpolate((agebrackets, ), wageprofile, Gridded(Linear()))

    xf = 16:90
    y_const = [itp_const[x] for x in xf]
    y_linear = [itp_linear[x] for x in xf];

    p = plot(
        layer(x=agebrackets, y=wageprofile, Geom.point, Theme(default_color=c
        layer(x=xf, y=y_const, Geom.line, Theme(default_color=colorant"green"
        layer(x=xf, y=y_linear, Geom.line, Geom.point, Theme(default_color=co
    )

    return p
end;
```

In [223]:
```
ex4_LinearInterpolation()
```

Out[223]:



2. Taylor approximation

Exercise 5.

Let the demand for a good be defined as $Q(p) = 0.5p^{-0.5} + 0.3p^{-0.2}$. Plot the original demand curve and Taylor approximations of degree one to three around $x_0 = 0.5$. Make four plots with distances of $0.1, 0.2, 0.5$ and 1.5 around x_0.

In [188]:

```
function ex5_Taylor(x_0)

    Q(p) = 0.5p^(-0.5)+(0.3)p^-0.2
    d1Q(p) = (-.5)(0.5)p^(-1.5) + (-.2)(0.3)p^(-1.2)
    d2Q(p) = (-1.5)(-.5)(0.5)p^(-2.5) + (-1.2)(-.2)(0.3)p^(-2.2)
    d3Q(p) = (-2.5)(-1.5)(-.5)(0.5)p^(-3.5) + (-2.2)(-1.2)(-.2)(0.3)p^(-3.2)

    Q1(x, x_0) = Q(x_0)*((x-x_0)^0/factorial(0))+d1Q(x_0)*((x-x_0)^1/factoria
    Q2(x, x_0) = Q(x_0)*((x-x_0)^0/factorial(0))+d1Q(x_0)*((x-x_0)^1/factoria
    Q3(x, x_0) = Q(x_0)*((x-x_0)^0/factorial(0))+d1Q(x_0)*((x-x_0)^1/factoria

    function graph_dist(Δ)

        xmin=max(0,x_0-Δ); xmax=x_0+Δ; x = xmin:0.001:xmax

        p = plot(
            layer(x=[x_0], y= [Q.(x_0)], Geom.point, Theme(default_color=colo
            layer(x=x, y= Q.(x), Geom.line, Theme(default_color=colorant"blac
            layer(x=x, y= Q1.(x, x_0), Geom.line, Theme(default_color=coloran
            layer(x=x, y= Q2.(x, x_0), Geom.line, Theme(default_color=coloran
            layer(x=x, y= Q3.(x, x_0), Geom.line, Theme(default_color=coloran
            Coord.Cartesian(xmin=xmin,xmax=xmax, ymin=0, ymax=3),
            Guide.title(string("Distance of ", Δ, " around x0")))
        return p
    end

    return gridstack([graph_dist(0.1) graph_dist(0.2); graph_dist(0.5) graph_
end;
```

In [190]:

```
set_default_plot_size(20cm,20cm)

@manipulate for x_0 in 0.2:0.1:1
    ex5_Taylor(x_0)
end
```

Out[190]: