

Q2

$$\hat{g} = \arg \min_g \left(\sum_{i=1}^n (y_i - g(x_i))^2 + \lambda \int [g^{(m)}(x)]^2 dx \right),$$

where $g^{(m)}$ represents the m th derivative of g (and $g^{(0)} = g$). Note

For all of (a) – (d): this sigma not counted, because is positive and constant. Arg min forces the integral to be near 0

(a) $m = 0$ $g^{(0)} \rightarrow 0 \Rightarrow \mathbf{g(x) = 0}$ will minimize the area (integral)

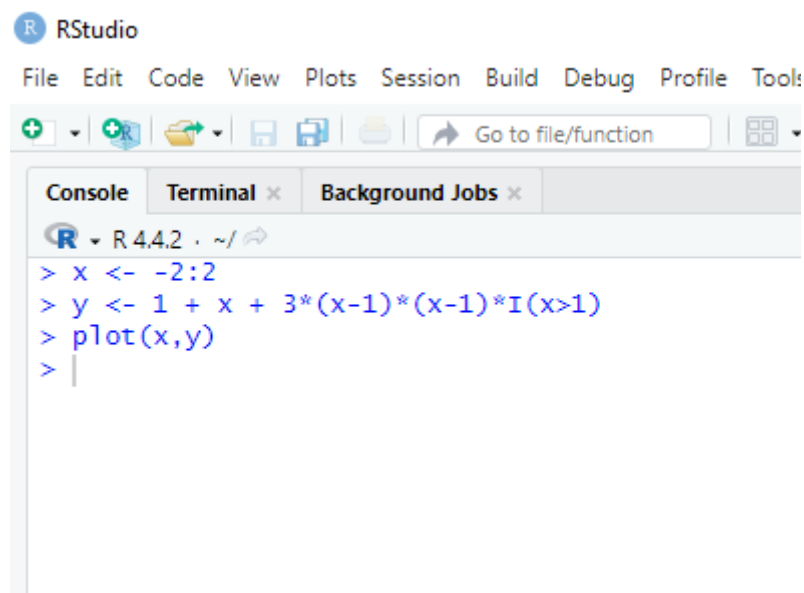
(b) $m = 1$ $g^{(1)} \rightarrow 0 \Rightarrow \hat{g} = \text{constant}$ (c)

(c) $m = 2$ $g^{(2)} \rightarrow 0 \Rightarrow \hat{g} = c*x + d$

(d) $m = 3$ $g^{(3)} \rightarrow 0 \Rightarrow \hat{g} = c*x^2 + d*x + k$

(e) The integral not counted. In this case g is a spline itself.

Q3



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RStudio
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R v. 4.4.2 . ~/
> x <- -2:2
> y <- 1 + x + 3*(x-1)*(x-1)*I(x>1)
> plot(x,y)
>
  
```

*** PLOT ON THE NEXT PAGE ***

