Assignment 8b

Satvik Saha

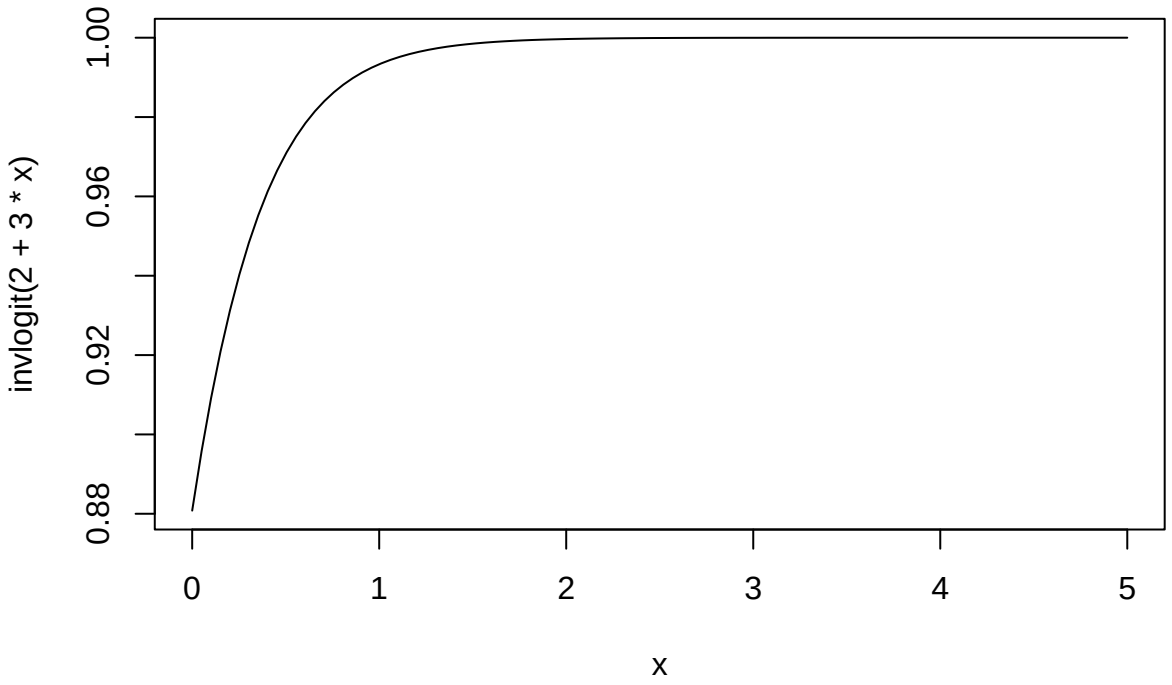
2024-10-28

Answer 1

(a)

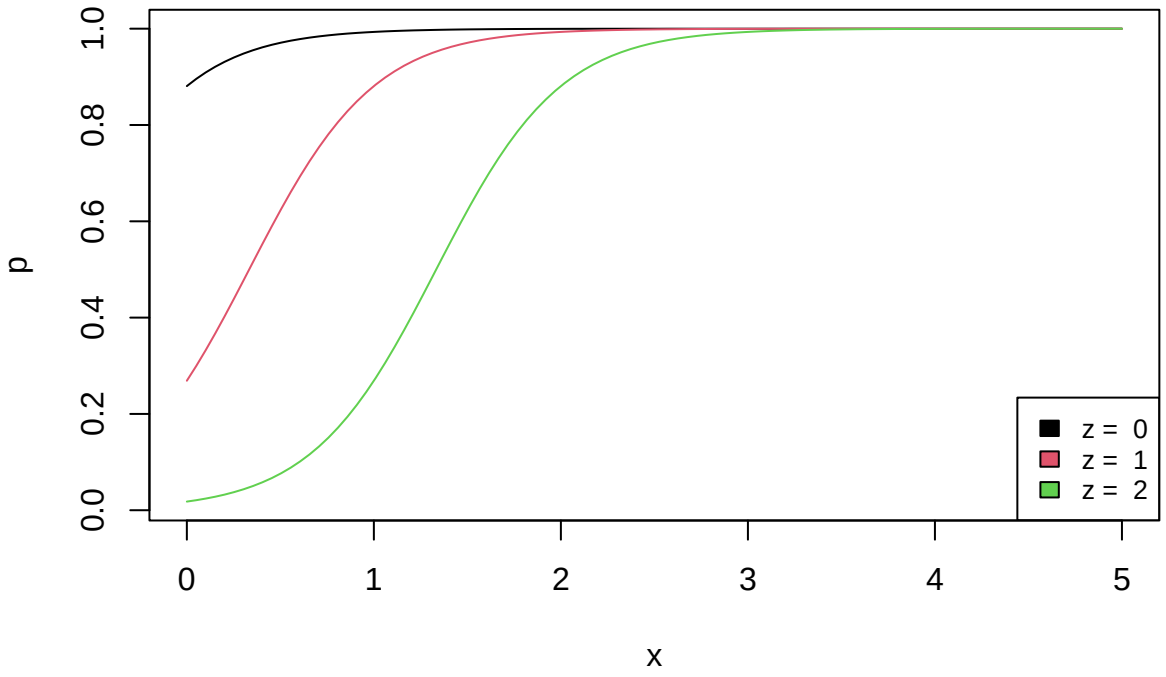
```
logit <- qlogis
invlogit <- plogis

x <- seq(0, 5, length.out = 100)
plot(x, invlogit(2 + 3 * x), type = "l")
```



(b)

```
z <- c(0, 1, 2)
p <- sapply(z, function(z) invlogit(2 + 3 * x - 3 * z))
labels <- sapply(z, function(z) paste("z = ", z))
matplot(x, p, type = "l", lty = 1)
legend("bottomright", labels, col = seq_along(z), fill = seq_along(z), cex = 0.8)
```



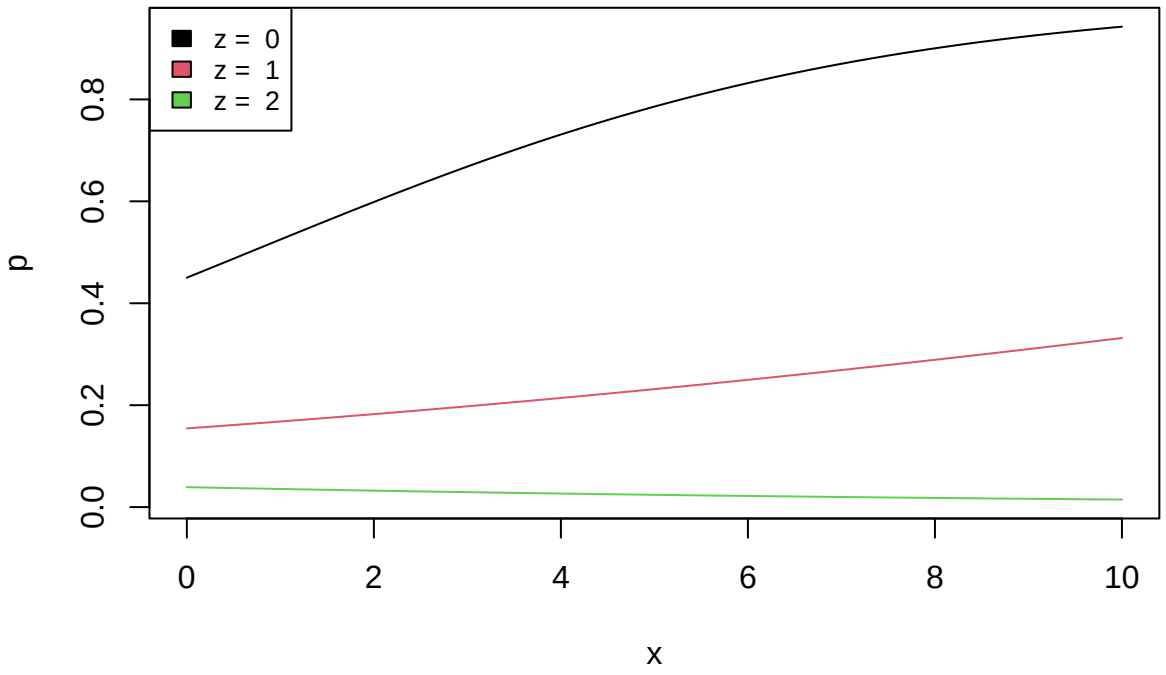
Answer 2

(a) We have the models

$$P(y = 1) = \text{logit}^{-1}(-0.2 + 0.3x), \qquad z = 0,$$
$$P(y = 1) = \text{logit}^{-1}(-1.7 + 0.1x), \qquad z = 1,$$
$$P(y = 1) = \text{logit}^{-1}(-3.2 - 0.1x), \qquad z = 2.$$

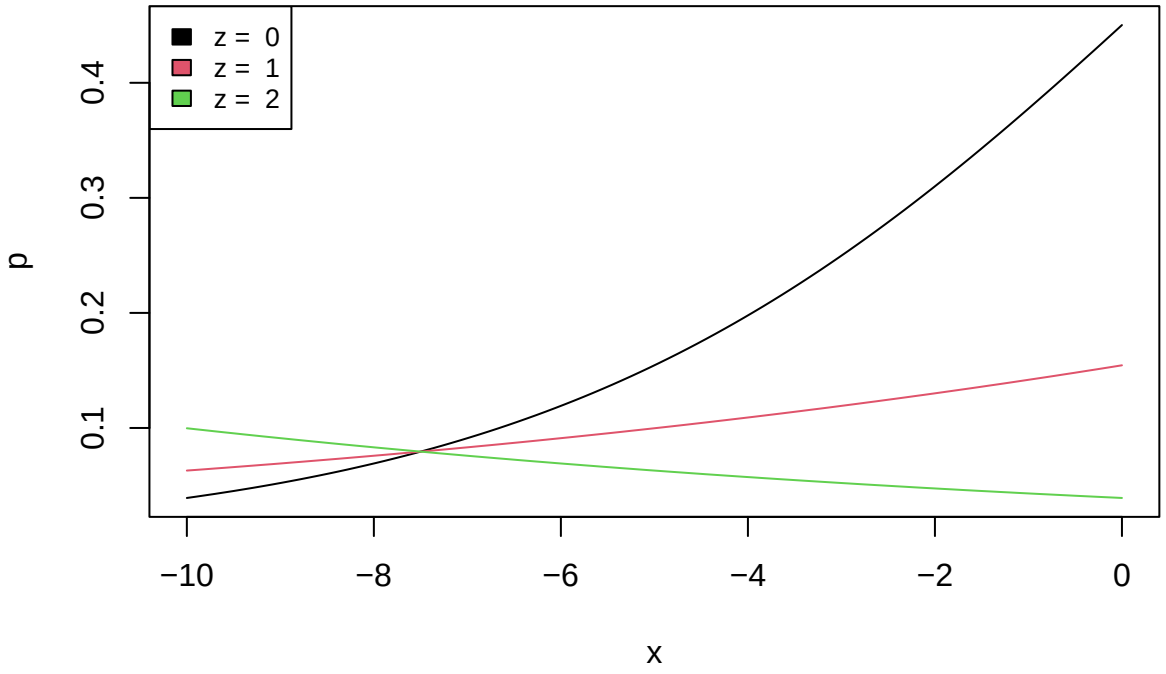
(b)

```
x <- seq(0, 10, length.out = 100)
z <- c(0, 1, 2)
p <- sapply(z, function(z) invlogit(-0.2 + 0.3 * x - 1.5 * z - 0.2 * x * z))
labels <- sapply(z, function(z) paste("z = ", z))
matplot(x, p, type = "l", lty = 1)
legend("topleft", labels, col = seq_along(z), fill = seq_along(z), cex = 0.8)
```



(b)

```r
x <- seq(-10, 0, length.out = 100)
z <- c(0, 1, 2)
p <- sapply(z, function(z) invlogit(-0.2 + 0.3 * x - 1.5 * z - 0.2 * x * z))
labels <- sapply(z, function(z) paste("z = ", z))
matplot(x, p, type = "l", lty = 1)
legend("topleft", labels, col = seq_along(z), fill = seq_along(z), cex = 0.8)
```



Note that $\text{logit}^{-1}(-0.2 + 0.3x - 1.5z - 0.2xz)$ is independent of z when $1.5z + 0.2xz = 0$, i.e. $x = -7.5$.