D.L. week 7 | 804864

1. a) & b)

$$f(x) = (x+1)^2 + (x+1)$$

$$= x^3 + x^2 - 2x^2 - 2x + x + 1$$

$$= x^3 - x^2 - x + 1$$

$$\frac{d}{dx} f(x) = 3x^2 - 2x - 1$$

$$f'(x) = 3x^2 - 2x - 1$$

$$f''(x) = 6x - 2$$

$$6x - 2 = 0$$

$$\Rightarrow 6x = 2$$

$$\Rightarrow \boxed{x = \frac{1}{3}}$$

$f''(x) = 6x - 2 \geq 0$ for $x \geq \frac{1}{3}$

So $f(x)$ is convex for $[\frac{1}{3}, \infty]$

a) $f(x)$ is not convex for all Real numbers ($x \in R$) as it is convex only for $x \geq \frac{1}{3}$.

B) $f(x)$ is convex for $x \in [1, \infty]$ as it is convex for $x \in [\frac{1}{3}, \infty]$