

$$6.4.) a.) f'(x) = 3x^2 + 12x - 15 = 0$$

$$x_1 = 1 \quad x_2 = -5$$

$$f''(x) = 6x + 12$$

$$f''(x_1) = 18 \rightarrow x_1 \text{ is local min.}$$

$$f''(x_2) = -18 \rightarrow x_2 \text{ is local max.}$$

no global min or max

$$b.) f'(x) = 6x^2 - 50x - 12 = 0$$

$$x_1 = \frac{25 + \sqrt{697}}{6}$$

$$x_2 = \frac{25 - \sqrt{697}}{6}$$

$$f''(x) = 12x - 50$$

$$f''(x_1) = 2\sqrt{697} \rightarrow x_1 \text{ is local min.}$$

$$f''(x_2) = -2\sqrt{697} \rightarrow x_2 \text{ is local max.}$$

no global min or max

$$c.) f'(x) = 9x^2 + 14x - 15 = 0$$

$$x_1 = \frac{-7 + \sqrt{184}}{9} \quad x_2 = \frac{-7 - \sqrt{184}}{9}$$

$$f''(x) = 18x + 14$$

$$f''(x_1) = 2\sqrt{184} \rightarrow x_1 \text{ is local min.}$$

$$f''(x_2) = -2\sqrt{184} \rightarrow x_2 \text{ is local max.}$$

no global min / max

$$d.) f(x) = 2xe^x + x^2e^x = e^x(2x + x^2)$$

$$x_1 = 0 \quad x_2 = -2$$

$$f'(x) = e^x(x^2 + 2x) + e^x(2x + 2) \\ = e^x(x^2 + 4x + 2)$$

$$f''(x_1) = 2 \quad \text{local min.}$$

$$f''(x_2) = -2e^{-2} \quad \text{local max.}$$

no global max but $x_1 = 0$ is global min.