

1. $f(x) = -3x^5 + 5x^3$

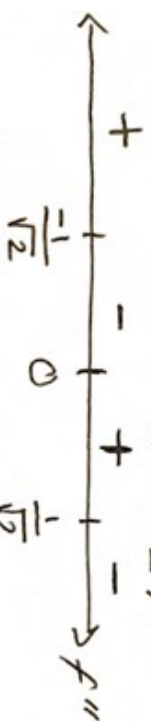
$$f'(x) = -15x^4 + 15x^2$$

$$= -15x^2(x^2 - 1)$$

(a) Critical Points $x=0, x=-1, x=1$

(b) $f''(x) = -60x^3 + 30x$

$$= -60x(x^2 - \frac{1}{2})$$



f Concave up: $(-\infty, -\frac{1}{\sqrt{2}}) \cup (0, \frac{1}{\sqrt{2}})$

f Concave down: $(-\frac{1}{\sqrt{2}}, 0) \cup (\frac{1}{\sqrt{2}}, \infty)$

(c) $f''(0) = 0$: Must use 1st Deriv Test

$f''(-1) > 0$: Local min

$f''(1) < 0$: Local max

(d) Inflection points at

$$x = -\frac{1}{\sqrt{2}}, \quad x = 0, \quad x = \frac{1}{\sqrt{2}}$$

L21 P3

2.

$$f(x) = x^2 e^x$$

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

$$= e^x \cdot x(2+x)$$

Crit #: $x=0, x=-2$

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

$$= e^x(x^2 + 4x + 2)$$

$f''(0) > 0$: local min

$f''(-2) < 0$: local max

$$g(x) = x^3 e^x$$

$$g'(x) = 3x^2 e^x + x^3 e^x$$

$$= e^x \cdot x^2(3+x)$$

Crit #: $x=0, x=-3$

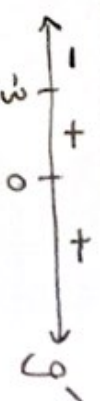
$$g''(x) = e^x(3x^2 + x^3) + e^x(6x + 3x^2)$$

$$= e^x(x^3 + 6x^2 + 6x)$$

$g''(0) = 0$: Must use 1st Deriv Test

$g''(-3) > 0$: local min

First Deriv Test.



No extrema at

$$x=0$$