(33) $f(x) = x^2(6-x)^3$

$f'(x) = x^2\left(3(6-x)^2 \cdot -1\right) + (6-x)^3 \cdot 2x$

$= -3x^2(6-x)^2 + 2x(6-x)^3 = 0$

$2x(6-x)^3 = 3x^2(6-x)^2$

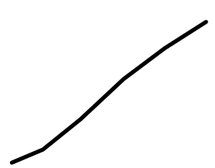
$2(6-x) = 3x \Rightarrow 12 - 2x = 3x$

$x = \frac{12}{5}$

$f''(x) = -3x^2 \cdot 2(6-x) \cdot -1 + (6-x)^2 \cdot -6x + 2x \cdot 3(6-x)^2 \cdot -1 + (6-x)^3 \cdot 2$

$= 6x^2(6-x) - 6x(6-x)^2 - 6x(6-x)^2 + 2(6-x)^3 = 36x^2 - 6x^3 - 12x(6-x)^2 + 2(6-x)^3$

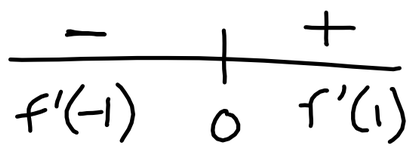
$f''\left(\frac{12}{5}\right) = 36\left(\frac{12}{5}\right)^2 - 6\left(\frac{12}{5}\right)^3 - 12\left(\frac{12}{5}\right)\left(6-\frac{12}{5}\right)^2 + 2\left(6-\frac{12}{5}\right)^3 = \frac{-3888}{25} \Rightarrow$ rel max @ $x = \frac{12}{5}$



(35) $f(x) = x^{2/3} - 3$

$f'(x) = \frac{2}{3}x^{-1/3} \neq 0 \Rightarrow$ use 1st Der. Test

$f'(x) = \frac{2}{3x^{1/3}}$



$\Rightarrow$ rel. min @ $x = 0$

(39) $f(x) = \cos x - x, \quad [0, 4\pi]$

$f'(x) = -\sin x - 1 = 0$

$\sin x = -1$

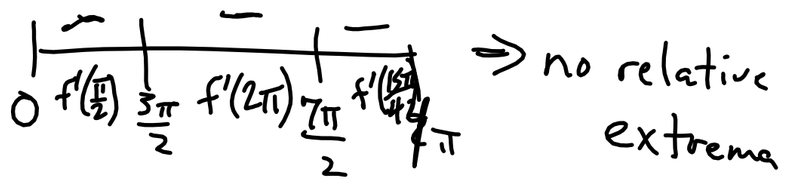
$x = \frac{3\pi}{2}, \frac{7\pi}{2}$

$f''(x) = -\cos x$

$f''\left(\frac{3\pi}{2}\right) = 0$

$f''\left(\frac{7\pi}{2}\right) = 0$

TEST FAILS



$\Rightarrow$ no relative extrema

HW: p. 195 → 4-40 mult. 4, 49-52