


22) $y = x^3 - 3x^2 + 3x - 2$
 $y' = 3x^2 - 6x + 3 = 0$
 $x = 1$
 $(1, -1)$
 No Max or Min



23) $y = \sqrt{x^2 - 1}$
 $y' = \frac{1}{2}(x^2 - 1)^{-\frac{1}{2}}(2x)$
 $= \frac{x}{\sqrt{x^2 - 1}}$
 $x = -1$
 $x = 1$
 $(-1, 0)$
 $(1, 0)$ → Min

24) $y = \frac{1}{x^2 - 1}$ Critical pts $(0, -1)$
 $y = (x^2 - 1)^{-1}$ $x = 1$ local Max
 $y' = -1(x^2 - 1)^{-2}(2x)$
 $= \frac{-2x}{(x^2 - 1)^2} = 0$

39) $y = x\sqrt{4-x^2}$ → $x > 2$ DNE $x < -2$ DNE
 $y' = x\left(\frac{1}{2}(4-x^2)^{-\frac{1}{2}}(-2x)\right) + \sqrt{4-x^2}$
 $y' = \frac{-x^2}{\sqrt{4-x^2}} + \sqrt{4-x^2}$ Critical pts $x = \sqrt{5}, 2$ Max
 $= \frac{-x^2 + 4 - x^2}{\sqrt{4-x^2}}$ $-2x^2 + 4 = 0$ $-2x^2 - 4$ $(-5, -2)$ Min
 $= \frac{-2x^2 + 4}{\sqrt{4-x^2}} = 0$ $x^2 = 2$ $x = \pm\sqrt{2}$ local Min $(2, 0)$
 $x = 2$ local Max $(-2, 0)$
 $x = -2$ local Max
 Note $x > 2$ DNE $x < -2$ DNE

40) $y = x^2\sqrt{3-x}$
 $y' = x^2\left(\frac{1}{2}(3-x)^{-\frac{1}{2}}(-1)\right) + \sqrt{3-x}(2x)$
 $= \frac{-x^2}{2\sqrt{3-x}} + \frac{2x\sqrt{3-x}}{2\sqrt{3-x}}$
 $= \frac{-x^2 + 4x(3-x)}{2\sqrt{3-x}}$
 $= \frac{-x^2 + 12x - 4x^2}{2\sqrt{3-x}}$ Critical Points
 $= \frac{-5x^2 + 12x}{2\sqrt{3-x}}$ $y' = 0$ $x = 0$ $(0, 0)$ Min
 $x = 2.4$ $(2.4, 4.5)$ local Max
 $-5x^2 + 12x = 0$ $x = 3$ $(3, 0)$ Min
 $x(-5x + 12) = 0$
 $x = 0$
 $x = 2.4$

38) $y = x^{\frac{2}{3}}(x^2 - 4)$
 $y' = x^{\frac{2}{3}}(2x) + (x^2 - 4)\left(\frac{2}{3}x^{-\frac{1}{3}}\right)$
 $y' = 2x^{\frac{5}{3}} + \frac{2}{3}x^{-\frac{1}{3}}(x^2 - 4)$
 $y' = 2x^{\frac{5}{3}} + \frac{2(x^2 - 4)}{3\sqrt[3]{x}}$
 $y' = \frac{2x^{\frac{5}{3}}(3\sqrt[3]{x})}{3\sqrt[3]{x}} + \frac{2(x^2 - 4)}{3\sqrt[3]{x}}$ Critical Points
 $y' = \frac{6x^2 + 2x^2 - 8}{3\sqrt[3]{x}}$ $y' = 0$ $x = 1$ $(1, -3)$ Min
 $x = -1$ $(-1, -3)$ Min
 $y' = \frac{8x^2 - 8}{3\sqrt[3]{x}}$ DNE $x = 0$ $(0, 0)$ local Max
 $8x^2 - 8 = 0 \Rightarrow x^2 = 1$
 $8x^2 = 8 \Rightarrow x = \pm 1$