Math 103.01 Summer 2001
Sample Test #2 Answers

1.

$(1, 1)$: local minimum of -1
$(-1, -1)$: local minimum of -1
$(0, 0, 0)$, $(\sqrt{3}, 0, 0)$, $(-\sqrt{3}, 0, 0)$: horizontal tangent plane

2.

maximum of 1
mimimum of $-\frac{1}{2}$

3.

- 1
- $\frac{4}{3}$
- 384π
- 4π
- $V = 8$
- 4π
- $V = \int_{-a}^{a} \int_{-\sqrt{b^2 - \frac{b^2}{a^2}x^2}}^{\sqrt{b^2 - \frac{b^2}{a^2}x^2}} \int_{0}^{h+x} dz\ dy\ dx = \int_{-a}^{a} \int_{-\sqrt{b^2 - \frac{b^2}{a^2}x^2}}^{\sqrt{b^2 - \frac{b^2}{a^2}x^2}} h + x\ dy\ dx = \int_{-a}^{a} 2(h+x)\sqrt{b^2 - \frac{b^2}{a^2}x^2}\ dx$
  $= \int_{-a}^{a} 2h\sqrt{b^2 - \frac{b^2}{a^2}x^2}\ dx + \int_{-a}^{a} 2x\sqrt{b^2 - \frac{b^2}{a^2}x^2}\ dx = \int_{-a}^{a} 2h\sqrt{b^2 - \frac{b^2}{a^2}x^2}\ dx + 0$
  The second integral is 0 since it is an integral of an odd function over a symmetric interval.
  $= \frac{2hb}{a} \int_{-a}^{a} \sqrt{a^2 - x^2}\ dx$
  This integral is $\frac{\pi a^2}{2}$ since it represents half the area of a circle of radius a.
  $= \frac{2hb}{a} \frac{\pi a^2}{2} = \pi abh$
- $\frac{1}{16}(\pi - 2)$

4. $\frac{125000}{27}\text{cm}^3$