Graph \( y = x \sqrt{16-x^2} \)

- **Domain**: Domain is all \( x \)'s such that \( 16-x^2 \geq 0 \) i.e. \( -4 \leq x \leq 4 \)

- **Critical Points**:
  \[ f'(x) = \frac{x}{\sqrt{16-x^2}} \left( \frac{16-x^2}{2} \right)^{-1} - \frac{(16-x^2)}{2} \left( \frac{x}{\sqrt{16-x^2}} \right) = \frac{16-2x^2}{\sqrt{16-x^2}} = \frac{2(8-x^2)}{\sqrt{16-x^2}} \]

  \[ f'(x) = \begin{cases} 2(2\sqrt{2}-x)(2\sqrt{2}+x) & \text{for } x \neq 0 \\ \frac{x}{\sqrt{16-x^2}} & \text{for } x = 0 \end{cases} \]

  \[ f'(x) = 0 \iff x = \pm 2\sqrt{2} \quad \text{in the domain} \]

  \[ f'(x) \text{ d.n.e. } \iff x = \pm 4 \quad \text{in the domain} \]

  The critical points are \( x = \pm 2\sqrt{2} \) and \( x = \pm 4 \)

- **Increasing/Decreasing Intervals**:
  \[ f \text{ is increasing on } [-2\sqrt{2}, 2\sqrt{2}] \]
  \[ f \text{ is decreasing on } [-4, -2\sqrt{2}] \cup [2\sqrt{2}, 4] \]

- **Local Extrema**:
  \[ f \text{ has a local minimum at } x = -2\sqrt{2} \text{ pt: } (-2\sqrt{2}, -8) \]
  \[ f \text{ has a local maximum at } x = 2\sqrt{2} \text{ pt: } (2\sqrt{2}, 8) \]

- **Concavity and Points of Inflection**:
  \[ f''(x) = 2 \frac{8-x^2}{\sqrt{16-x^2}} \]

  \[ f''(x) = 2 \frac{\sqrt{16-x^2}(-2x) - (8-x^2)(-\frac{1}{2})(-2x)}{(16-x^2)^{3/2}} = 2 \frac{\sqrt{16-x^2}(8-x^2) - (-2x)(16-x^2)}{(16-x^2)^{3/2}} = \frac{2x(8-x^2)}{(16-x^2)^{3/2}} \]

  \[ f''(x) = 2 \frac{x(8-x^2)}{(16-x^2)^{3/2}} \]

  \[ f''(x) = 0 \iff x = 0 \quad \text{in domain} \quad \text{or } x = \pm 4 \quad \text{not in domain} \]

  \[ f''(x) \text{ d.n.e. } \iff x = \pm 4 \quad \text{in domain} \]

  The hypercritical points are \( x = 0, x = \pm 4 \)

  \[ f \text{ is concave up on } [-4, 0] \]
  \[ f \text{ is concave down on } [0, 4] \]

  \[ f \text{ has a pt. of inflection at } x = 0 \text{ pt: } (0, 0) \]

- **Intercepts**:
  \[ y \text{-int: } \text{Set } x = 0 \iff y = 0 \iff (0, 0) \text{ is the } y \text{-int} \]

  \[ x \text{-int: } \text{Set } y = 0 \iff x \sqrt{16-x^2} = 0 \iff x = 0 \text{ or } \frac{16-x^2}{x} = \pm 4 \]

  \[ \text{The } x \text{-int are } (0, 0), (-4, 0) \text{ and } (4, 0) \]
(f) **Intercepts:**

**Y-int:** Set $x = 0 \Rightarrow y = 0 \Rightarrow (0, 0)$ is the **Y-int**.

**X-int:** Set $y = 0 \Rightarrow x \sqrt{16-x^2} = 0 \Rightarrow x = 0$ or $\frac{16-x^2}{x} = \pm 4$.

\[ \therefore \text{The X-int are } (0,0), (-4,0) \text{ and } (4,0). \]

(g) **Vertical and Horizontal Asymptotes:**

There are no vertical asymptotes (because there is no $x$-value $a$ such that $\lim_{x \to a} f(x) = \pm \infty$).

**Horiz. Asym.:** $\lim_{x \to \pm \infty} f(x)$ and $\lim_{x \to -\infty} f(x)$ both do not exist.

Therefore, there are no horizontal asymptotes either.

**GRAPH:**

![Graph Image]