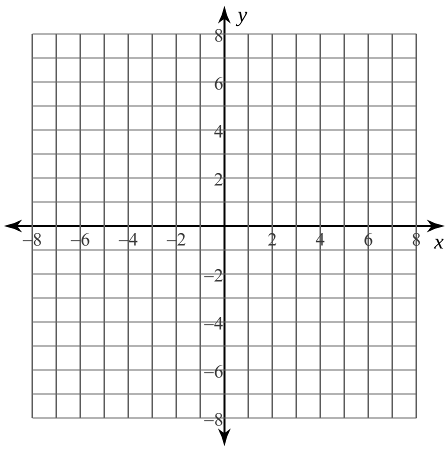
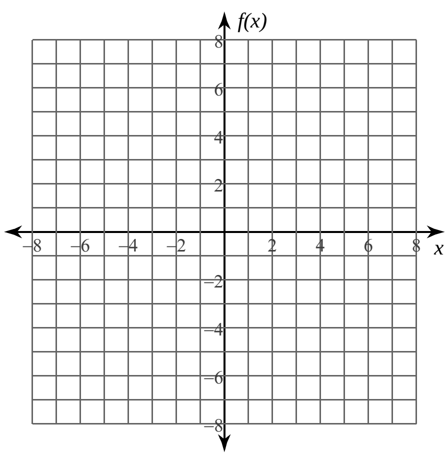
# Calculus Practice: Curve Sketching 3

**For each problem, find the: x and y intercepts, asymptotes, x-coordinates of the critical points, open intervals where the function is increasing and decreasing, x-coordinates of the inflection points, open intervals where the function is concave up and concave down, and relative minima and maxima. Using this information, sketch the graph of the function.**

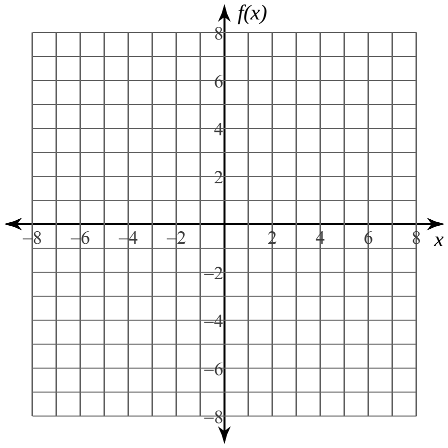
1) $y = \frac{x^4}{8} - \frac{x^2}{4}$



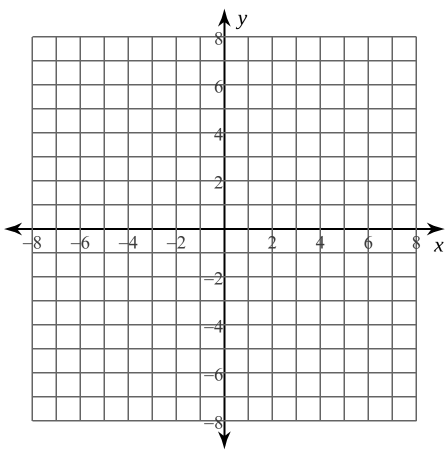

2) $f(x) = \frac{x^4}{4} - \frac{5x^2}{4}$



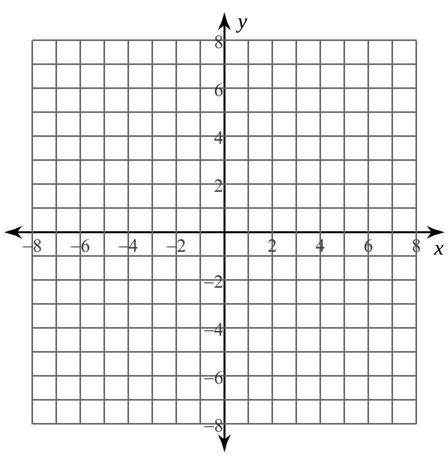
3) $f(x) = \frac{x^4}{8} - \frac{x^2}{8}$




4) $y = -\frac{x^4}{2} + x^2 - \frac{1}{2}$




5) $y = \frac{x^4}{8} - \frac{x^2}{4} + \frac{1}{8}$



Name_______________________



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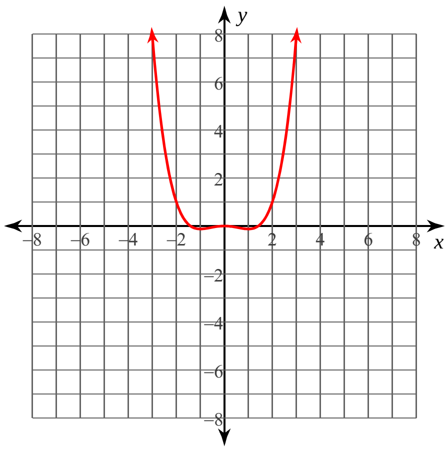
1) $y = \frac{x^4}{8} - \frac{x^2}{4}$




$x$-intercepts at $x = -\sqrt{2}, 0, \sqrt{2}$ $y$-intercept at $y = 0$

No vertical asymptotes exist.

No horizontal asymptotes exist.

Critical points at: $x = -1, 0, 1$

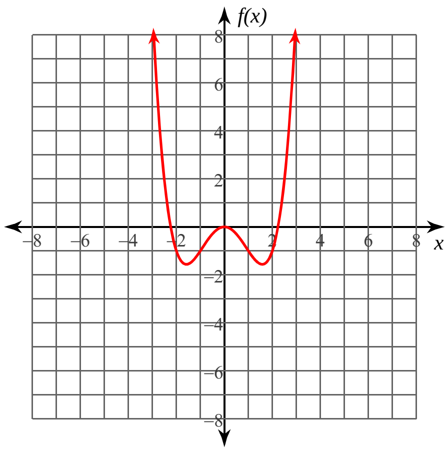
Increasing: $(-1, 0), (1, \infty)$ Decreasing: $(-\infty, -1), (0, 1)$

Inflection points at: $x = -\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}$

Concave up: $\left(-\infty, -\frac{\sqrt{3}}{3}\right), \left(\frac{\sqrt{3}}{3}, \infty\right)$ Concave down: $\left(-\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}\right)$

Relative minima: $\left(-1, -\frac{1}{8}\right), \left(1, -\frac{1}{8}\right)$ Relative maximum: $(0, 0)$

2) $f(x) = \frac{x^4}{4} - \frac{5x^2}{4}$




$x$-intercepts at $x = -\sqrt{5}, 0, \sqrt{5}$ $y$-intercept at $y = 0$

No vertical asymptotes exist.

No horizontal asymptotes exist.

Critical points at: $x = -\frac{\sqrt{10}}{2}, 0, \frac{\sqrt{10}}{2}$

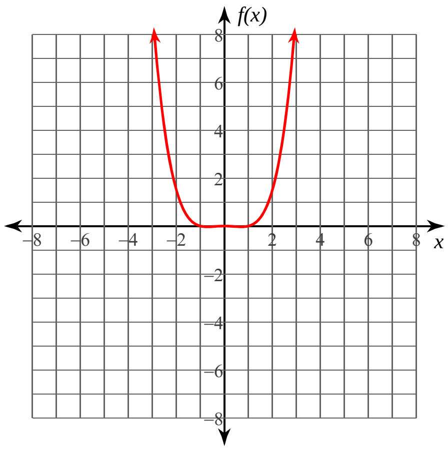
Increasing: $\left(-\frac{\sqrt{10}}{2}, 0\right), \left(\frac{\sqrt{10}}{2}, \infty\right)$ Decreasing: $\left(-\infty, -\frac{\sqrt{10}}{2}\right), \left(0, \frac{\sqrt{10}}{2}\right)$

Inflection points at: $x = -\frac{\sqrt{30}}{6}, \frac{\sqrt{30}}{6}$

Concave up: $\left(-\infty, -\frac{\sqrt{30}}{6}\right), \left(\frac{\sqrt{30}}{6}, \infty\right)$ Concave down: $\left(-\frac{\sqrt{30}}{6}, \frac{\sqrt{30}}{6}\right)$

Relative minima: $\left(-\frac{\sqrt{10}}{2}, -\frac{25}{16}\right), \left(\frac{\sqrt{10}}{2}, -\frac{25}{16}\right)$ Relative maximum: $(0, 0)$

3) $f(x) = \frac{x^4}{8} - \frac{x^2}{8}$




$x$-intercepts at $x = -1, 0, 1$ $y$-intercept at $y = 0$

No vertical asymptotes exist.

No horizontal asymptotes exist.

Critical points at: $x = -\frac{\sqrt{2}}{2}, 0, \frac{\sqrt{2}}{2}$

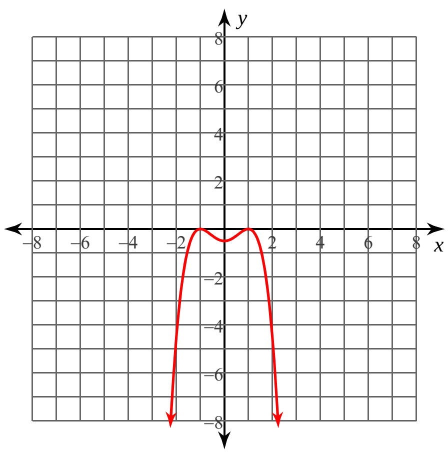
Increasing: $\left(-\frac{\sqrt{2}}{2}, 0\right), \left(\frac{\sqrt{2}}{2}, \infty\right)$ Decreasing: $\left(-\infty, -\frac{\sqrt{2}}{2}\right), \left(0, \frac{\sqrt{2}}{2}\right)$

Inflection points at: $x = -\frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}$

Concave up: $\left(-\infty, -\frac{\sqrt{6}}{6}\right), \left(\frac{\sqrt{6}}{6}, \infty\right)$ Concave down: $\left(-\frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}\right)$

Relative minima: $\left(-\frac{\sqrt{2}}{2}, -\frac{1}{32}\right), \left(\frac{\sqrt{2}}{2}, -\frac{1}{32}\right)$ Relative maximum: $(0, 0)$

4) $y = -\frac{x^4}{2} + x^2 - \frac{1}{2}$




$x$-intercepts at $x = -1, 1$ $y$-intercept at $y = -\frac{1}{2}$

No vertical asymptotes exist.

No horizontal asymptotes exist.

Critical points at: $x = -1, 0, 1$

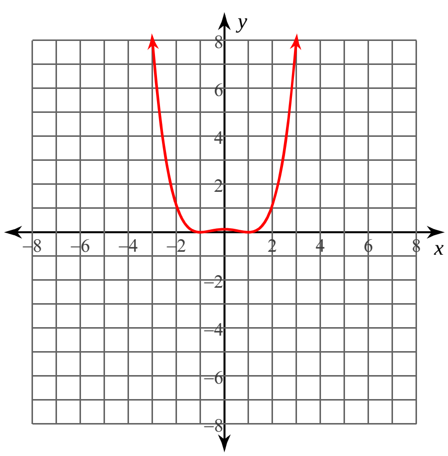
Increasing: $(-\infty, -1), (0, 1)$ Decreasing: $(-1, 0), (1, \infty)$

Inflection points at: $x = -\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}$

Concave up: $\left(-\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}\right)$ Concave down: $\left(-\infty, -\frac{\sqrt{3}}{3}\right), \left(\frac{\sqrt{3}}{3}, \infty\right)$

Relative minimum: $\left(0, -\frac{1}{2}\right)$ Relative maxima: $(-1, 0), (1, 0)$

5) $y = \frac{x^4}{8} - \frac{x^2}{4} + \frac{1}{8}$




$x$-intercepts at $x = -1, 1$ $y$-intercept at $y = \frac{1}{8}$

No vertical asymptotes exist.

No horizontal asymptotes exist.

Critical points at: $x = -1, 0, 1$

Increasing: $(-1, 0), (1, \infty)$ Decreasing: $(-\infty, -1), (0, 1)$

Inflection points at: $x = -\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}$

Concave up: $\left(-\infty, -\frac{\sqrt{3}}{3}\right), \left(\frac{\sqrt{3}}{3}, \infty\right)$ Concave down: $\left(-\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}\right)$

Relative minima: $(-1, 0), (1, 0)$ Relative maximum: $\left(0, \frac{1}{8}\right)$