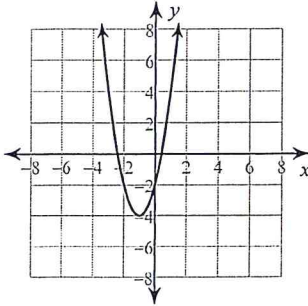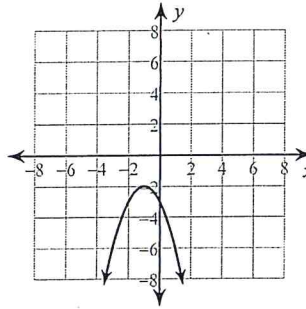# Answers to Curve Sketching Worksheet (ID: 1)

1)

x-intercepts at $x = -1 - \sqrt{2}, -1 + \sqrt{2}$
y-intercept at $y = -2$
Critical point at: $x = -1$
Increasing: $(-1, \infty)$
Decreasing: $(-\infty, -1)$
No inflection points exist.
Concave up: $(-\infty, \infty)$
Concave down: No intervals exist.
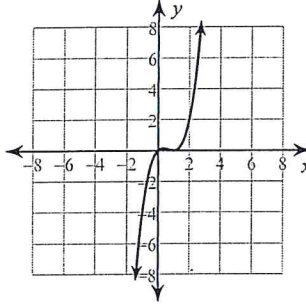Relative minimum: $(-1, -4)$
No relative maxima.

2)

No x-intercepts.
y-intercept at $y = -3$
Critical point at: $x = -1$
Increasing: $(-\infty, -1)$
Decreasing: $(-1, \infty)$
No inflection points exist.
Concave up: No intervals exist.
Concave down: $(-\infty, \infty)$
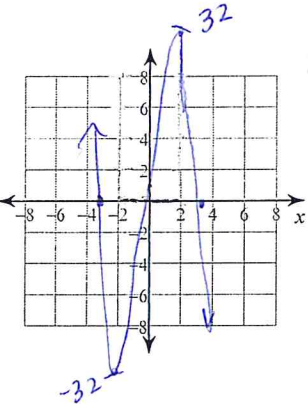No relative minima.
Relative maximum: $(-1, -2)$

3)
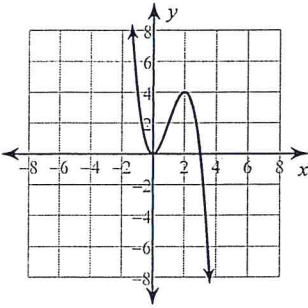
x-intercepts at $x = 0, 3$
y-intercept at $y = 0$
No vertical asymptotes exist.
No horizontal asymptotes exist.
Critical points at: $x = 0, 2$
Increasing: $(0, 2)$
Decreasing: $(-\infty, 0), (2, \infty)$
Inflection point at: $x = 1$
Concave up: $(-\infty, 1)$
Concave down: $(1, \infty)$
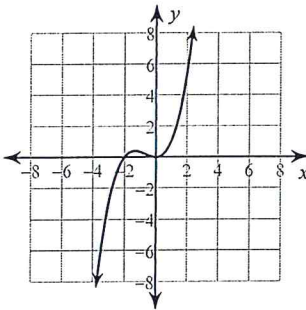Relative minimum: $(0, 0)$
Relative maximum: $(2, 4)$

4)

x-intercepts at $x = 0, 1$
y-intercept at $y = 0$
No vertical asymptotes exist.
No horizontal asymptotes exist.
Critical points at: $x = \dfrac{1}{3}, 1$
Increasing: $\left(-\infty, \dfrac{1}{3}\right), (1, \infty)$
Decreasing: $\left(\dfrac{1}{3}, 1\right)$
Inflection point at: $x = \dfrac{2}{3}$
Concave up: $\left(\dfrac{2}{3}, \infty\right)$
Concave down: $\left(-\infty, \dfrac{2}{3}\right)$
Relative minimum: $(1, 0)$
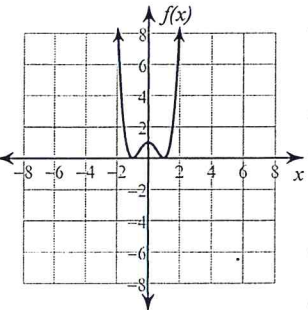Relative maximum: $\left(\dfrac{1}{3}, \dfrac{4}{27}\right)$

5)

x-intercepts at $x = 0, \pm\sqrt{12}$
y-intercept at $y = 0$
No vertical asymptotes exist.
No horizontal asymptotes exist.
Critical points at: $x = \pm 2$
Increasing: $(-2, 2)$
Decreasing: $(-\infty, -2)(2, \infty)$
Inflection point at: $x = 0$
Concave up: $(-\infty, 0)$
Concave down: $(0, \infty)$
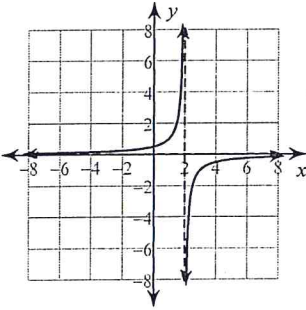Relative minimum: $(-2, -32)$
Relative maximum: $(2, 32)$

6)

x-intercepts at $x = -2, 0$
y-intercept at $y = 0$
No vertical asymptotes exist.
No horizontal asymptotes exist.
Critical points at: $x = -\dfrac{4}{3}, 0$
Increasing: $\left(-\infty, -\dfrac{4}{3}\right), (0, \infty)$
Decreasing: $\left(-\dfrac{4}{3}, 0\right)$
Inflection point at: $x = -\dfrac{2}{3}$
Concave up: $\left(-\dfrac{2}{3}, \infty\right)$
Concave down: $\left(-\infty, -\dfrac{2}{3}\right)$
Relative minimum: $(0, 0)$
Relative maximum: $\left(-\dfrac{4}{3}, \dfrac{32}{81}\right)$

7)

x-intercepts at $x = -1, 1$
y-intercept at $y = 1$
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: $x = -\dfrac{\sqrt{3}}{3}, \dfrac{\sqrt{3}}{3}$
Concave up: $\left(-\infty, -\dfrac{\sqrt{3}}{3}\right), \left(\dfrac{\sqrt{3}}{3}, \infty\right)$
Concave down: $\left(-\dfrac{\sqrt{3}}{3}, \dfrac{\sqrt{3}}{3}\right)$
Relative minima: $(-1, 0), (1, 0)$
Relative maximum: $(0, 1)$

8)

No x-intercepts.
y-intercept at $y = \dfrac{1}{2}$
~~No critical points exist.~~ critical pt x=2
Increasing: $(-\infty, 2), (2, \infty)$
Decreasing: No intervals exist.
No inflection points exist.
Concave up: $(-\infty, 2)$
Concave down: $(2, \infty)$
No relative minima.
No relative maxima.

9)
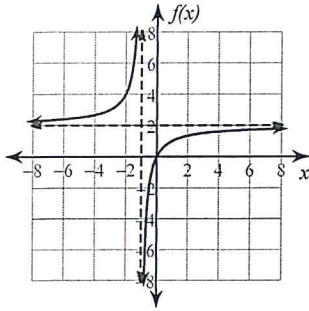
x-intercept at $x = 0$
y-intercept at $y = 0$
Vertical asymptote at: $x = -1$
Horizontal asymptote at: $f = 2$
~~No critical points exist.~~   critical pt at $x = -1$
Increasing: $(-\infty, -1), (-1, \infty)$
Decreasing: No intervals exist.
No inflection points exist.
Concave up: $(-\infty, -1)$
Concave down: $(-1, \infty)$
No relative minima.
No relative maxima.