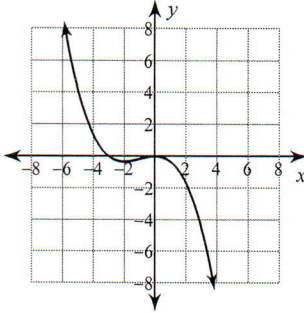


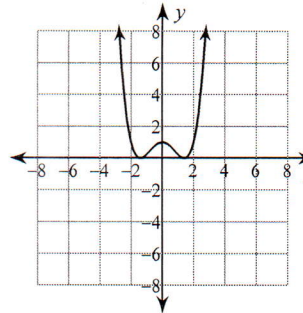
# Answers to 17 Curve Sketching

1)



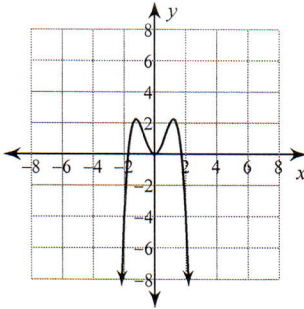
$x$ -intercepts at  $x = -3, 0$   
 $y$ -intercept at  $y = 0$   
 No vertical asymptotes exist.  
 No horizontal asymptotes exist.  
 Critical points at:  $x = -2, 0$   
 Increasing:  $(-2, 0)$   
 Decreasing:  $(-\infty, -2), (0, \infty)$   
 Inflection point at:  $x = -1$   
 Concave up:  $(-\infty,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

2)



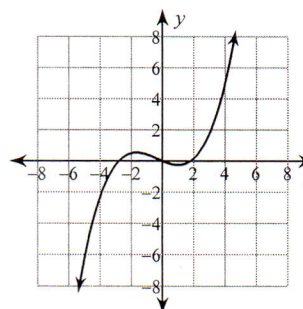
$x$ -intercepts at  $x = -\sqrt{2}, \sqrt{2}$   
 $y$ -intercept at  $y = 1$   
 No vertical asymptotes exist.  
 No horizontal asymptotes exist.  
 Critical points at:  $x = -\sqrt{2}, 0, \sqrt{2}$   
 Increasing:  $(-\sqrt{2}, 0), (\sqrt{2}, \infty)$   
 Decreasing:  $(-\infty, -\sqrt{2}), (0, \sqrt{2})$   
 Inflection points at:  $x = -\frac{\sqrt{6}}{3}, \frac{\sqrt{6}}{3}$   
 Concave up:  $(-\infty, -\frac{\sqrt{6}}{3}), (\frac{\sqrt{6}}{3}, \infty)$   
 Concave down:  $(-\frac{\sqrt{6}}{3}, \frac{\sqrt{6}}{3})$   
 Relative minima:  $(-\sqrt{2}, 0), (\sqrt{2}, 0)$   
 Relative maximum:  $(0, 1)$

3)



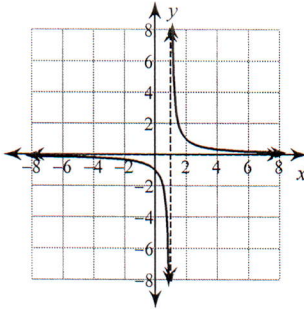
$x$ -intercepts at  $x = -\sqrt{3}, 0, \sqrt{3}$   
 $y$ -intercept at  $y = 0$   
 No vertical asymptotes exist.  
 No horizontal asymptotes exist.  
 Critical points at:  $x = -\frac{\sqrt{6}}{2}, 0, \frac{\sqrt{6}}{2}$   
 Increasing:  $(-\infty, -\frac{\sqrt{6}}{2}), (0, \frac{\sqrt{6}}{2})$   
 Decreasing:  $(-\frac{\sqrt{6}}{2}, 0), (\frac{\sqrt{6}}{2}, \infty)$   
 Inflection points at:  $x = -\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}$   
 Concave up:  $(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$   
 Concave down:  $(-\infty, -\frac{\sqrt{2}}{2}), (\frac{\sqrt{2}}{2}, \infty)$   
 Relative minimum:  $(0, 0)$   
 Relative maxima:  $(-\frac{\sqrt{6}}{2}, \frac{9}{4}), (\frac{\sqrt{6}}{2}, \frac{9}{4})$

4)



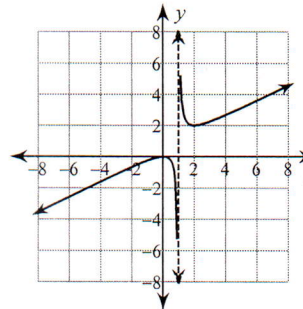
$x$ -intercepts at  $x = \frac{-1 - \sqrt{21}}{2}, 0, \frac{-1 + \sqrt{21}}{2}$   
 $y$ -intercept at  $y = 0$   
 No vertical asymptotes exist.  
 No horizontal asymptotes exist.  
 Critical points at:  $x = -\frac{5}{3}, 1$   
 Increasing:  $(-\infty, -\frac{5}{3}), (1, \infty)$   
 Decreasing:  $(-\frac{5}{3}, 1)$   
 Inflection point at:  $x = -\frac{1}{3}$   
 Concave up:  $(-\frac{1}{3}, \infty)$   
 Concave down:  $(-\infty, -\frac{1}{3})$   
 Relative minimum:  $(1, -\frac{1}{4})$   
 Relative maximum:  $(-\frac{5}{3}, \frac{175}{324})$

5)



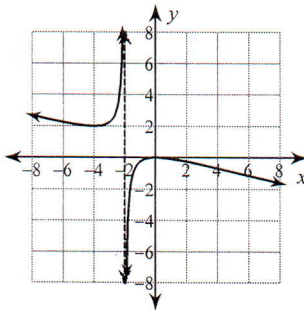
No  $x$ -intercepts.  
 $y$ -intercept at  $y = -1$   
 Vertical asymptote at:  $x = 1$   
 Horizontal asymptote at:  $y = 0$   
 No critical points exist.  
 Increasing: No intervals exist.  
 Decreasing:  $(-\infty, 1), (1, \infty)$   
 No inflection points exist.  
 Concave up:  $(1, \infty)$   
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

6)



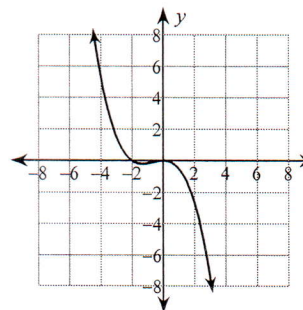
$x$ -intercept at  $x = 0$   
 $y$ -intercept at  $y = 0$   
 Vertical asymptote at:  $x = 1$   
 No horizontal asymptotes exist.  
 Slant asymptote:  $y = \frac{x}{2} + \frac{1}{2}$   
 Critical points at:  $x = 0, 2$   
 Increasing:  $(-\infty, 0), (2, \infty)$   
 Decreasing:  $(0, 1), (1, 2)$   
 No inflection points exist.  
 Concave up:  $(1, \infty)$   
 Concave down:  $(-\infty, 1)$   
 Relative minimum:  $(2, 2)$   
 Relative maximum:  $(0, 0)$

7)



$x$ -intercept at  $x = 0$   
 $y$ -intercept at  $y = 0$   
 Vertical asymptote at:  $x = -2$   
 No horizontal asymptotes exist.  
 Slant asymptote:  $y = -\frac{x}{4} + \frac{1}{2}$   
 Critical points at:  $x = -4, 0$   
 Increasing:  $(-4, -2), (-2, 0)$   
 Decreasing:  $(-\infty, -4), (0, \infty)$   
 No inflection points exist.  
 Concave up:  $(-\infty, -2)$   
 Concave down:  $(-2, \infty)$   
 Relative minimum:  $(-4, 2)$   
 Relative maximum:  $(0, 0)$

8)



$x$ -intercepts at  $x = -2, 0$   
 $y$ -intercept at  $y = 0$   
 No vertical asymptotes exist.  
 No horizontal asymptotes exist.  
 Critical points at:  $x = -\frac{4}{3}, 0$   
 Increasing:  $(-\frac{4}{3}, 0)$   
 Decreasing:  $(-\infty, -\frac{4}{3}), (0, \infty)$   
 Inflection point at:  $x = -\frac{2}{3}$   
 Concave up:  $(-\infty, -\frac{2}{3})$   
 Concave down:  $(-\frac{2}{3}, \infty)$   
 Relative minimum:  $(-\frac{4}{3}, -\frac{16}{81})$   
 Relative maximum:  $(0, 0)$