Answer Key:

1.) (0, 5/3) minimum; (5,5) maximum

2.) (0,0)& (3, 0) minimum; (3/2, 9/4) maximum

3.) (2, -1.2378) minimum; (-1, 1.5) maximum

4.)(0, -1/2) max; (1,-1) min

5.) (0,-1), $\left(\frac{3\pi}{2}, -1\right)$, $(2\pi, -1)$ min; $\left(\frac{\pi}{2}, 3\right)$ max

6.) (0,1) min; $\left(\frac{\pi}{3}, 2\right)$ max

7.) A: relative max; B: relative min; C: absolute max; D: absolute min

8.) A: absolute max; B: neither; C: relative max; D: relative min

9.) Rolle's Theorem can be applied; c = 1

10.) Rolle's Theorem can be applied; $c = \left\{\frac{\pi}{2}, \frac{3\pi}{2}\right\}$

11.) Rolle's Theorem cannot be applied because it's not a continuous function (discontinuous @ x = 0)

12.) When the Mean Value Theorem is applied, the answer is -222°F/hour. Since that is the average throughout the interval, there has to be a least one time when it's decreasing at that rate.

13.) When the Mean Value Theorem is applied, the answer is 1500 miles per hour^2. Since that is the average throughout the interval, there has to be a least one time when it's increasing at that rate.

14.) decreasing: $(-\infty, 3)$; increasing: (3, ∞); minimum @ (3, -9)

15.) increasing: $(-\infty, -2)$ & $(1, \infty)$; decreasing: (-2, 1); max @ (-2, 20); min @ (1,-7)

16.) increasing: $(-\infty, -1)$ & $(1, \infty)$; decreasing: $(-1,1)$; max @ (-1, 0.8); min @ (1, -0.8)

17.) increasing: $\left(0, \frac{\pi}{4}\right)$ & $\left(\frac{5\pi}{4}, 2\pi\right)$; decreasing: $\left(\frac{\pi}{4}, \frac{5\pi}{4}\right)$; max @ $\left(\frac{\pi}{4}, \sqrt{2}\right)$, min @ $\left(\frac{5\pi}{4}, -\sqrt{2}\right)$

18.) increasing: $\left(0, \frac{\pi}{3}\right)$ & $\left(\frac{4\pi}{3}, 2\pi\right)$; decreasing: $\left(\frac{\pi}{3}, \frac{4\pi}{3}\right)$; max @$\left(\frac{\pi}{3}, 2\right)$, min @ $\left(\frac{4\pi}{3}, -2\right)$

19.) increasing: $\left(0, \frac{\pi}{2}\right)$, $\left(\frac{7\pi}{6}, \frac{3\pi}{2}\right)$, $\left(\frac{11\pi}{6}, 2\pi\right)$; decreasing: $\left(\frac{\pi}{2}, \frac{7\pi}{6}\right)$, $\left(\frac{3\pi}{2}, \frac{11\pi}{6}\right)$; max: $\left(\frac{\pi}{2}, 2\right)$, $\left(\frac{3\pi}{2}, 0\right)$; min: $\left(\frac{7\pi}{6}, -\frac{1}{4}\right)$, $\left(\frac{11\pi}{6}, -\frac{1}{4}\right)$