**W2 – Maxima and Minima** Unit 2

*MCV4U*

*Jensen*

**1)** Find the critical numbers for each function

**a)** $f(x) = -x^2 + 6x + 2$

**b)** $f(x) = x^3 - 2x^2 + 3x$

**c)** $g(x) = 2x^3 - 3x^2 - 12x + 5$

**d)** $y = x - \sqrt{x}$

**2)** Determine the absolute extreme values of each function on the given interval.

**a)** $y = 3x^2 - 12x + 7, 0 \leq x \leq 4$

**b)** $g(x) = 2x^3 - 3x^2 - 12x + 2, -3 \leq x \leq 3$

**c)** $f(x) = x^3 + x, 0 \leq x \leq 10$

**3)** Find and classify the critical points of each function as a local max, local min, or neither.

**a)** $y = 4x - x^2$

**b)** $f(x) = (x-1)^4$

**c)** $g(x) = 2x^3 - 24x + 5$

**d)** $y = \frac{1}{4}x^4 - \frac{2}{3}x^3$

**4)a)** Find the critical numbers of $f(x) = 2x^3 - 3x^2 - 12x + 5$

**b)** Find any local extrema of $f(x)$.

**c)** Find the absolute extrema of $f(x)$ in the interval $[-2,4]$.

**5)** A section of rollercoaster is in the shape of $f(x) = -x^3 - 2x^2 + x + 15$, where $x$ is between $-2$ and 2.

**a)** Find all local extrema and explain what portions of the rollercoaster they represent.

**b)** Is the highest point of this section of the ride at the beginning, the end, or neither?

**Answers:**

**1)a)** $x = 3$ **b)** no critical numbers **c)** $x = -1,2$ **d)** $x = \frac{1}{4}$

**2)a)** absolute max at $(0,7)$ and $(4,7)$
absolute min at $(2,-5)$

**b)** absolute max at $(-1,9)$
absolute min at $(-3,-43)$

**c)** absolute max at $(10,1010)$
absolute min at $(0,0)$

**3)a)** $(2,4)$ is a local max **b)** $(1,0)$ is a local min **c)** $(-2,37)$ is a local max; $(2,-27)$ is a local min
**d)** $(0,0)$ is neither; $\left(2,-\frac{4}{3}\right)$ is a local min

**4)a)** $x = -1,2$ **b)** $(-1,12)$ is a local max; $(2,-15)$ is a local min **c)** $(2,-15)$ is the absolute min, $(4,37)$ is the absolute max

**5)a)** The coaster starts down a hill from $x = -2$, reaching a local min at the bottom of a hill at $(-1.55,12.37)$. It then increases height until it reaches a local max at the top of a hill at $(0.22,15.11)$. It then continues downward until $x = 2$.
**b)** The highest point is at $(0.22,15.11)$, not either of the endpoints.