2.2 Maxima and Minima Worksheet

This document was composed and formatted by Annie Bernatchez.

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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) $y = 4x - x^2$

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Test value			
$f'(x)$			
$f(x)$			

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

Test value			
$f'(x)$			
$f(x)$			

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

Test					
$f'(x)$					
$f(x)$					

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

Test value					
$f'(x)$					
$f(x)$					

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

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

Test					
$f'(x)$					
$f(x)$					

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.

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Test					
$f'(x)$					
$f(x)$					

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

Answer Key

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.

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