

WORKSHEET 7 ANSWERS

Problem 1. a) critical points at $x=-1$, $x=2$.

increasing $(-\infty, -1) \cup (2, \infty)$, decreasing $(-1, 2)$.

b) critical points at nowhere. decreasing on $(-\infty, 4) \cup (4, \infty)$.

c) critical points at $x=0$. decreasing on $(-\infty, 0)$, increasing on $(0, \infty)$.

d) critical points at $x=0$ & $x = \frac{2}{\ln(2)}$. decreasing $(-\infty, 0) \cup (\frac{2}{\ln(2)}, \infty)$, increasing $(0, \frac{2}{\ln(2)})$.

e) critical point at $x=0$. decreasing on $(-\infty, 0)$, increasing on $(0, \infty)$.

f) critical point at $x=7$. decreasing on $(3, 7)$, increasing on $(7, \infty)$.

Problem 2. $C'(x) = 3x^2 - 4x + 8$ has no roots. $C(x)$ is always increasing.

Problem 3. increasing on $(0, 3)$, decreasing $(3, \infty)$. Maximum at $t=3$ hours.

Problem 4. $R = 200qe^{-q/10}$

Maximum revenue at $q=10$

$$\frac{dR}{dq} = -20e^{-q/10}(q-10)$$

and $p = 200e^{-1}$.

Problem 5. It reaches a height of 28 ft, and is in the air for about 2.57 seconds.

Problem 6. ~~answer~~ omitted, use Wolfram Alpha to check your answers.

Problem 7. a) $f''(x) = 2$ always concave up

b) $f''(x) = \frac{6}{(x-5)^3}$ concave down $(-\infty, 5)$, concave up $(5, \infty)$.

c) $f''(x) = 6x + 20$ concave down $(-\infty, 10/3)$, concave up $(10/3, \infty)$

d) $f''(x) = 2^{1-x^2} \ln(2)(x^2 \ln(4) - 1)$ concave down ~~on~~ $(\frac{-1}{\sqrt{\ln(4)}}, \frac{1}{\sqrt{\ln(4)}})$, concave up elsewhere.

Problem 8. $f(1995)$ is the crime rate (some positive number)

$f'(1995)$ is positive since the rate is increasing

$f''(1995)$ is negative since the rate is increasing more slowly than before.