MA125 Quiz 2

Name:

1) (8 pts) Suppose

$$f'(x) = xe^{-x^2}$$

a) On what interval(s) is $f(x)$ increasing?

b) On what interval(s) is $f(x)$ decreasing?

c) Does $f(x)$ have a maximum or minimum?

e^{-x^2} is always > 0

sign of xe^{-x^2} is determined by the sign of x. So,

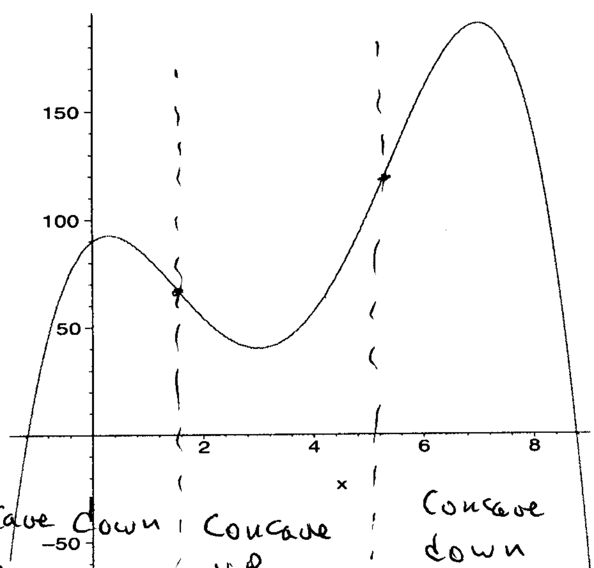
$f'(x)$ is:

f is increasing $\rightarrow$ positive on $(0, \infty)$

f is decreasing $\rightarrow$ negative on $(-\infty, 0)$

$f'(x)$ crosses the x-axis at $x=0$, is negative to the left, and positive to the right: $\Rightarrow$ Local minimum at $x=0$

2) (8 pts) Below is the graph of a **function** $f(x)$. Use the graph of $f(x)$ to determine the intervals on which the **derivative** $f'(x)$ is increasing or decreasing.



Concave down | Concave up | Concave down

$f''(x) < 0$ | $f''(x) > 0$ | $f''(x) < 0$

$f'(x) \downarrow$ | $f'(x) \uparrow$ | $f'(x) \downarrow$

The derivative is increasing where $f''(x) > 0$

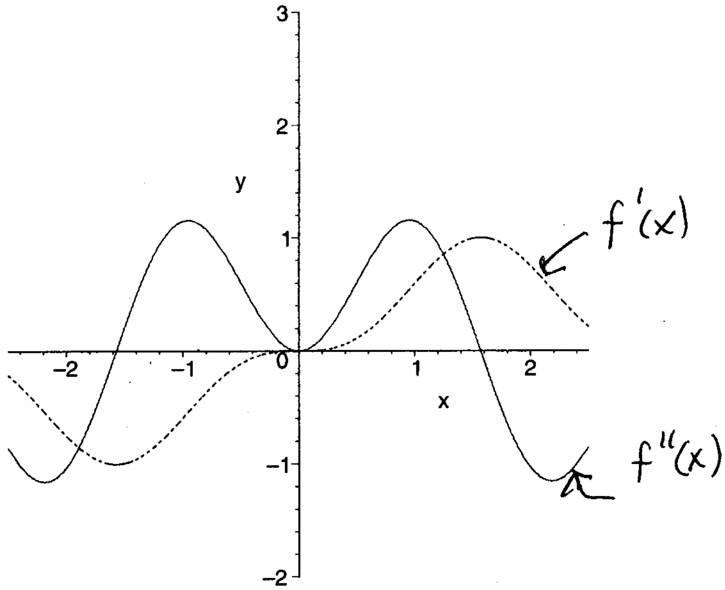
We don't have $f''(x)$, but we can tell where it is positive from the graph of $f(x)$. $f''(x)$ is positive where the graph of $f(x)$ is concave up, negative where it's concave down

(OVER)

$f'(x)$ is increasing on $(1.8, 5)$

$f'(x)$ is decreasing on $(-2, 1.8) \cup (5, 8.8)$ (approximately)

3) (9 pts) The following graph shows a plot of the first derivative $f'(x)$ and the second derivative $f''(x)$ on the interval $[-2.5, 2.5]$ for some function $f(x)$.



1) Indicate which curve is $f'(x)$ and which is $f''(x)$.

2) On what parts of the interval is the **function** $f(x)$:

a) increasing? $(0, 2.5)$

b) decreasing? $(-2.5, 0)$

c) concave up? $(-1.6, 1.6)$

d) concave down? $(-2.5, -1.6) \cup (1.6, 2.5)$

3) Where (if anywhere) does f have a:

a) local maximum? none

b) local minimum? $x = 0$

minimum because: $\begin{cases} f'(0) = 0 \\ f'(x) < 0 \text{ for } x \text{ to the left of } 0 \\ f'(x) > 0 \text{ for } x \text{ to the right of } 0 \end{cases}$