Name _____

You have 10 minutes for this quiz.

1. (3 points) Carefully write down the content of *The Mean Value Theorem.*

Let f be a function satisfying the following:

(1) f is continuous on $[a,b]$

(2) f is differentiable on (a,b)

Then there is a number c in (a,b) such that $f'(c) = \dfrac{f(b)-f(a)}{b-a}$

2. (3 points) A function f has the following second derivative. Determine the x-value for each inflection point on the graph of f.

$$f''(x) = 4e^x(x-3)(x-5)^2$$

Since $4e^x$ and $(x-5)^2$ are never negative and $(x-3)$ is negative when $x<3$ and positive when $x>3$, $f''(x) = 4e^x(x-3)(x-5)^2$ is negative for $x<3$ and positive for $x>3$ (except for $x=5$, where $f''(x)=0$), so the only inflection point is at $x=3$.

3. (4 points) Upon which interval is the graph of $f(x) = 2 + 3xe^{-4x}$ increasing?

$f'(x) = 3e^{-4x} - 12xe^{-4x} = 3e^{-4x}(1-4x)$.

Since $3e^{-4x}$ is always positive and

$1-4x > 0 \iff x < \frac{1}{4}$ we have

$f'(x) = 3e^{-4x}(1-4x) > 0 \iff x < \frac{1}{4}$.

Thus $f(x)$ is increasing on the interval $(-\infty, \frac{1}{4})$.