University of California, Davis -- Department of Economics Professor Giacomo Bonanno

ECN 103 : Economics of Uncertainty and Information

MATH QUIZ to test your readiness for this class

If you have any difficulties answering the questions below, then you should not take this class. Calculus will be used extensively in ECN 103

The answers are given at the end of this file.

First some notation. Let $f(x)$ be a real-valued function; then its first derivative is denoted by $f'(x)$ or $\frac{d}{dx}f(x)$ and its second derivative by $f''(x)$ or $\frac{d^2}{dx^2}f(x)$.

1. Let $f(x)=120-\left(\frac{x}{4}\right)^2$. **(a)** Calculate $f(20)$. **(b)** Calculate $f'(x)$. (**c**) Calculate $f'(20)$.

(d) Calculate $f''(x)$. (**c**) Calculate $f''(20)$.

2. Let $f(x)=6x^3$. **(a)** Calculate $f(3)$. **(b)** Calculate $f'(x)$. (**c**) Calculate $f'(3)$.

(d) Calculate $f''(x)$. (**c**) Calculate $f''(3)$.

3. Let $f(x)=12\sqrt{x}$. **(a)** Calculate $\frac{d}{dx}f(x)$. (**b**) Calculate $\frac{d^2}{dx^2}f(x)$.

4. Let $f(x)=2\ln\left(\frac{x}{2}\right)$, where ln denotes the natural logarithm (that is, the logarithm to the base *e*).

(a) Calculate $\frac{d}{dx}f(x)$. (**b**) Calculate $\frac{d^2}{dx^2}f(x)$.

5. Let $f(x)=x(60-2x)-4x$. Find the value of x that maximizes the function *f*.

6. Let $f(x)=200-\left(\frac{x}{2}\right)^2$. **(a)** Draw the graph of the function f for $x\in[0,400]$.

(b) Write the equation of the straight line that is tangent to the graph of f at the point x = 100.

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ANSWERS to MATH QUIZ

1. Let $f(x)=120-\left(\frac{x}{4}\right)^2$. **(a)** $f(20)=95$. **(b)** $f'(x)=-\frac{x}{8}$. **(c)** $f'(20)=-\frac{5}{2}=-2.5$.

(d) $f''(x)=-\frac{1}{8}$. **(c)** $f''(20)=-\frac{1}{8}$.

2. Let $f(x)=6x^3$. **(a)** $f(3)=162$. **(b)** $f'(x)=18x^2$. **(c)** $f'(3)=162$.

(d) $f''(x)=36x$. **(c)** $f''(3)=108$.

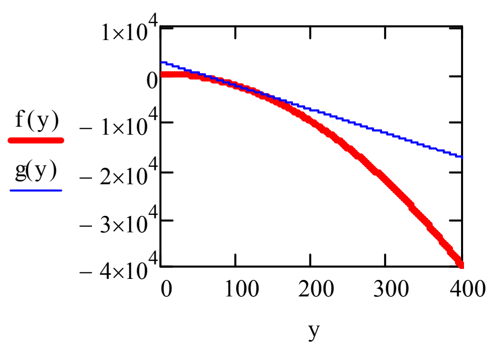
3. Let $f(x)=12\sqrt{x}$. **(a)** $\frac{d}{dx}f(x)=\frac{6}{\sqrt{x}}$. **(b)** $\frac{d^2}{dx^2}f(x)=-\frac{3}{x^{\frac{3}{2}}}=-\frac{3}{\sqrt{x^3}}$.

4. Let $f(x)=2\ln\left(\frac{x}{2}\right)$, where ln denotes the natural logarithm (that is, the logarithm to the base *e*).

(a) $\frac{d}{dx}f(x)=\frac{2}{x}$. **(b)** $\frac{d^2}{dx^2}f(x)=-\frac{2}{x^2}$.

5. Let $f(x)=x(60-2x)-4x$. The value of x that maximizes the function f is given by the solution to $f'(x)=0$, that is, the solution to $56-4x=0$. Hence $x = 14$.

6. Let $f(x)=200-\left(\frac{x}{2}\right)^2$. **(a)** The graph of the function f for $x\in[0,400]$ is shown below as the thick curve:



(b) The equation of the straight line that is tangent to the graph of f at the point $x = 100$ is given by $y=f(100)+f'(100)(x-100)=2,700-50x$ (its graph is shown above as the thin straight line).