## Essentials of Calculus

## Homework 3.2

Exponentials and logarithms

1. For each function $f(x)$, find $f^{\prime}(x)$.
a) $f(x)=10^{x}$
b) $f(x)=2 x^{3}+3 \cdot 2^{x}$
c) $f(x)=9 x^{4}-5 x+3-5 \cdot 2^{x}$
d) $f(x)=5 \cdot 3^{x}+3 \cdot 5^{x}$
e) $f(x)=2 x^{3}-5 x+2 e^{x}$
f) $f(x)=6 e^{x}+6 x^{7}-3 \ln (x)$
g) $f(x)=5 \ln (x)-\frac{5}{x}$
2. Let $f(x)=3 x^{2}+x-2 e^{x}$.
a) Find $f^{\prime}(0), f^{\prime}(1)$ and $f^{\prime}(2)$.
b) Find an equation for the tangent line at $x=0$.
3. Let $f(x)=3 x^{2}+2 \ln (x)$. Find an equation for the tangent line at $x=1$.
4. If $\$ 100$ is put in a bank at $5 \%$ yearly interest, compounded continuous, in $t$ years there will be $f(t)=100 e^{0.05 t}$ dollars. Find $f(5)$ and $f^{\prime}(5)$, with units. Say what they represent.
5. A certain car is worth $f(t)=5000 e^{-0.05 t}$ dollars in $t$ years. Find $f(10)$ and $f^{\prime}(10)$, with units. Say what they represent.
6. The human population of a certain region $t$ years from now is given by $P(t)=10000(.995)^{t}$. Find $P(50)$ and $P^{\prime}(50)$, with units, and give their interpretation.
7. It costs a company $C(q)=500+200 \ln (q)$ dollars to make $q$ objects. Find the total cost and marginal cost at a production level of $q=100$ objects.
