| MA 120-04 <br> §1.1-3.3 | TeSt \#1 |  | Name: $-\quad$ score |
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1. A potato that is at room temperature is placed inside a $350^{\circ}$-degree oven for one hour. Let $T(t)$ denote the temperature in degrees Fahrenheit at time $t$, where $t$ is measured in minutes elapsed since the potato was placed in the oven.
Sketch a graph of temperature $T$ as a function of time $t$ that reflects the given information. Scale (put numbers on) the axes that correspond to the given data. (9 points)

2. How much money should be invested now at a continuously compounded rate of $5 \%$ so that in 30 years there is a total of $\$ 50,000$ ? ( 9 points)
3. If you want an investment to double every 12 years, what annual interest rate is needed? You may use the rule of 70 to estimate the answer, if you like. (9 points)
4. A function $f(x)$ is graphed to the right. Estimate the derivative of the function at $x=1$, i.e., estimate the value of $f^{\prime}(1)$. Then sketch the graph of $f^{\prime}(x)$ on the same set of axes. (9 points)

5. If $f(20)=12.4$ and if $f^{\prime}(20)=0.4$, estimate the value of $f(24)$. Show your work. (9 points)
6. Sketch a graph of a function $f$ with the the following properties: (9 points)
(a) $f^{\prime}(x)>0$ on $[-3,0)$ and on $(2,3]$
(b) $f^{\prime}(x)<0$ on $(0,2)$
(c) $f^{\prime \prime}(x)<0$ on $[-3,1)$
(d) $f^{\prime \prime}(x)>0$ on $(1,3]$
(e) $f(0)=0$

7. Estimate the value of $f^{\prime}(30)$ from the following table. (10 points)

| $x$ | 10 | 20 | 30 | 40 |
| :---: | :---: | :---: | :---: | :---: |
| $f(x)$ | 17.1 | 22.5 | 26.0 | 29.1 |

8. Find an equation of the tangent line to the graph of $y=x^{2}-x+1$ when $x=2$. (9 points)
9. Find the derivative of the following functions. (9 points each)
(a) $f(x)=3 x^{8}-2 x^{3}+x^{2}-17$
(b) $f(x)=\left(x^{2}+3 x-10\right)^{8}$
(c) $f(x)=e^{x^{2}+3}$
