

Test 2

Name: _____

Show your work! Answers that do not have a justification will receive no credit.

1. (25 points) Find the derivatives of the following:

(a) $f(x) = 5x^4 - 9x^3 + 3x - 4.$

$$f'(x) =$$

(b) $V = 4s^2 - 4\sqrt{s^3}$

$$\frac{dV}{ds} =$$

(c) $h(u, v) = (4u^2v + uv)^{17}$

$$\frac{\partial h}{\partial u} =$$

(d) $H(\theta) = \sin \theta + 2 \cos \theta + 3 \tan \theta$

$$H'(\theta) =$$

(e) $D = 2 \cdot 5^{\frac{3}{7}} + \frac{7}{t^3} + 9^t$

$$\frac{dD}{dt} =$$

(f) $P(x) = P_0(1.09)^{x^2-x},$ (where P_0 is a constant.)

$$P'(x) =$$

(g) $A(\alpha, \beta) = 5 \left(\frac{2\alpha^2\beta + \alpha\beta^2}{\sqrt{1 + \beta^4}} \right)$

$$\frac{\partial A}{\partial \alpha} =$$

2. (10 points) Measurements of the temperature (in degrees F) of a cup of hot water are made every 10 seconds. Some of the measurements are given in the table. What (approximately) is the rate of change of the temperature when $t = 100$ secs?

time	Temp.
80	94.60
90	94.25
100	93.90
110	93.55
120	93.20

3. (10 points) Let $V(s) = \frac{s^3}{4} + s$. Write the microscope equation at the point where $s = -2$.

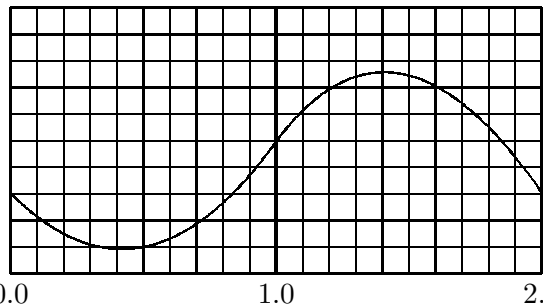
4. (15 points) Fill in the blanks.

(a) If $f(-2) = 3$ and $f'(-2) = -5$ a reasonable estimate of $f(-2.2)$ is _____.

(b) If $g(4) = 3$ and $g'(4) = .4$ a reasonable estimate of $g(4.5)$ is _____.

(c) If $h(7) = .4$ and $h'(7) = 2$ a reasonable estimate of $h(\text{_____})$ is 0.

5. (20 points) Let $y = f(x)$ have the graph as shown. Then answer the following.



(a) What is an approximation to $f'(1.1)$? 0.0

(b) For what values of x is $f'(x) = 0$? _____

(c) On what intervals is $f'(x)$ negative? _____

(d) Draw your own axis and sketch a graph of the derivative $y = f'(x)$.

6. (20 points) Assume that the number K of acres of kudzu in the city of Columbia satisfies the rate equation

$$K' = .001K(200 - K)$$

where the time t is measured in years and K' is measured in acres per year.

(a) If at the beginning of 1995 there were 100 acres of kudzu in Columbia then write the microscope equation relating ΔK and Δt at the beginning of 1995.

Answer: _____

(b) Using the data from part (a) estimate the number of acres of kudzu in Columbia at that end of March (that is after 3 months = .25 years.)

Answer: _____

(c) Again using the data from part (a) estimate the time when there was only 90 acres of kudzu in Columbia.

Answer: _____