

Mathematics 122 Test #2

Name: _____

You are to use your own calculator, no sharing.

Show your work to get credit.

A blank page is attached for scratch work.

(1) (45 points) Compute the following derivatives. Assume that a , b , and c are constants.

(a) $p = 5t^6 - 3t^4 + 8t^2 - 9$ $\frac{dp}{dt} =$ _____

(b) $C = \frac{3}{\sqrt{q}} - \frac{5}{5q^4}$ $\frac{dC}{dq} =$ _____

(c) $y = -3e^x + 7\ln(x)$ $y' =$ _____

(d) $R = 3b \cdot 7^t$ $R' =$ _____

(e) $y = -5(4x + 2)^{13}$ $y' =$ _____

(f) $R(x) = 8e^{3x^2}$ $R'(x) =$ _____

(g) $w = 5\ln(z^3 + z^2)$ $\frac{dw}{dz} =$ _____

(h) $A(r) = 4\sqrt{e^r + r}$ $A'(r) =$ _____

(i) $F(t) = 5e^{3t^4}$ $F'(t) =$ _____

(j) $y = \sqrt{x}e^{3x^2}$ $y' =$ _____

(k) $u = \frac{t^2 - 1}{t^2 + 1}$ $\frac{du}{dt} =$ _____

(l) $H(r) = (3r + 1)(r^4 + r^2)^5$ $H'(r) =$ _____

(m) $p = 2 \cos(\theta) + 3 \sin(\theta)$ $\frac{dp}{d\theta} =$ _____

(n) $y = \cos(2x) + \sin(3x)$ $y' =$ _____

(o) $A(r) = 3 \cos^4(6r)$ $A'(r) =$ _____

(2) (10 Points) Find the second derivatives of the following functions.

(a) $y = 7x^3 + 2x^2 - 9x + 11$ $y'' =$ _____

(b) $w = 3e^{2z} + 4 \ln(z)$ $\frac{d^2w}{dz^2} =$ _____

(3) (5 points) Find the tangent line to $y = 3x^3 - 5x$ at the point where $x = 2$.

(4) (15 Points) Draw graphs of functions with the following properties

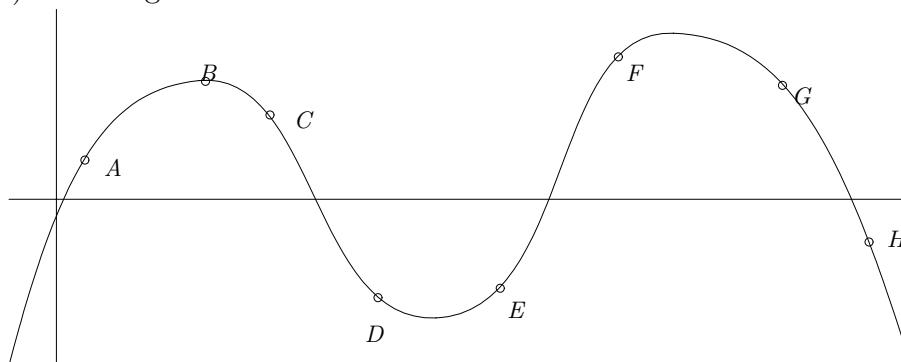
(a) f is increasing at a decreasing rate.

(b) $f' < 0$ and $f'' > 0$.

(c) $f(3) = 1$, $f'(3) = 0$ and $f''(x) < 0$

- (d)
- $f(1) = -3$, $f(2) = 1$, $f(4) = -2$,
 - $f'(1) = f'(2) = f'(4) = 0$,
 - $f'(x) < 0$ for $x < 1$ and $2 < x < 4$,
 - $f'(x) > 0$ for $1 < x < 2$ and $4 < x$.

(5) (5 Points) In the figure



(a) At which of the labeled points is $f(x) > 0$.

(b) At which of the labeled points is $f'(x) > 0$.

(c) At which of the labeled points is $f''(x) > 0$.

(6) (7 Points) For a function given by the table

t	2.0	2.2	2.4	2.6
$A(t)$	3.7	3.4	2.9	2.0

(a) Make a table for $A'(t)$.

(b) Make a table for $A''(t)$.

(7) (8 Points) A roast chicken is taken out of the oven to cool. Let $T(t)$ be temperature of the chicken in degrees Fahrenheit t minutes after it was removed from the oven. Assume that $T(20) = 120$ and that $T'(20) = -3.5$

(a) Explain why $T'(20)$ is negative.

(b) What are the units on $T(20)$? _____

(c) What are the units on $T'(20)$? _____

(d) Estimate $T(22)$.

$T(22) \approx$ _____

(e) Estimate $T(19)$.

$T(19) \approx$ _____

(8) (10 Points) A group of students decide to sell Gamecock coffee cups. Figure 1 shows the cost $C(q)$ (in dollars) and revenue $R(q)$ (in dollars) for selling q of the head bands.

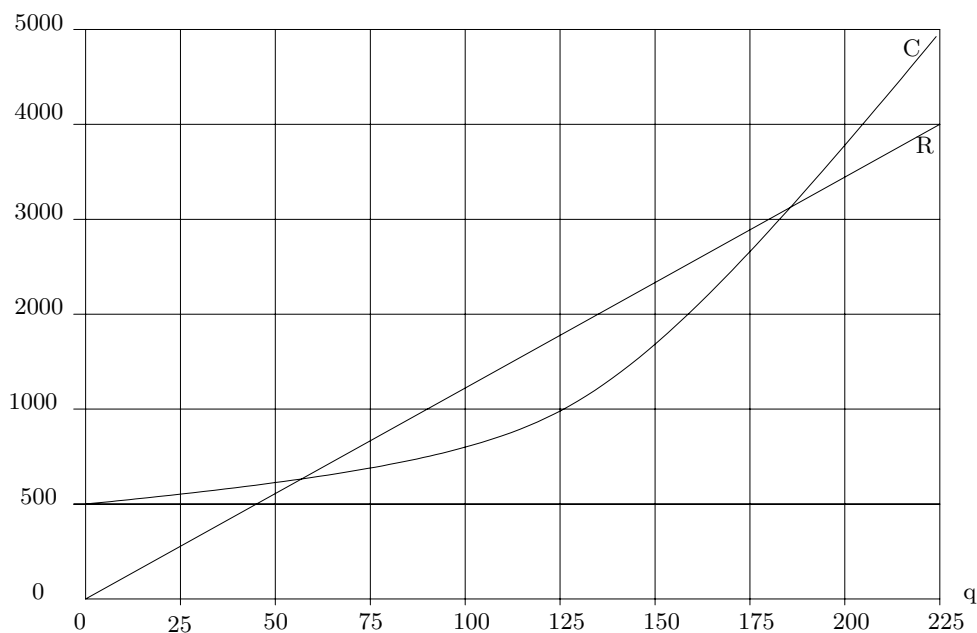


FIGURE 1

(a) What are the startup costs for the students? _____

(b) At what price are the students selling the coffee cups? _____

(c) Estimate the cost of producing the 125th coffee. (That is estimate the marginal cost $C'(125)$).

$C'(125) \approx$ _____

(d) Estimate the number of coffee cups the students should sell to maximize their profit.
