1. (1 pt) Suppose you have a function $f(x)$ and all you know is that $f(3) = 19$ and the graph of its derivative is:
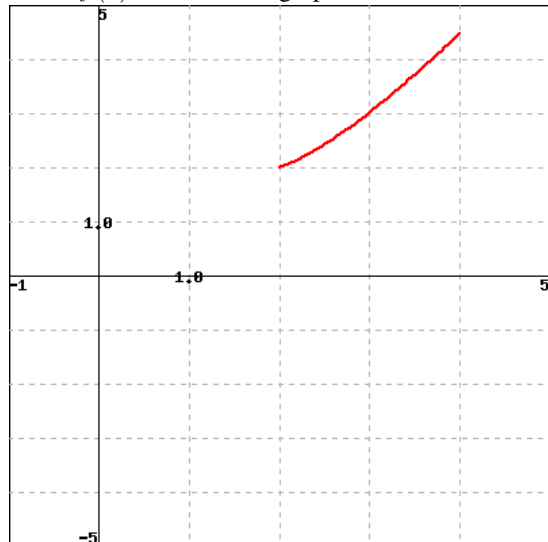

Use linear approximation to estimate $f(3.1)$: _____
Is your answer a little to big or a little too small?(Enter TB or TS): _____

Answer(s) submitted:

-
-

(incorrect)

2. (2 pts) Use linear approximation, i.e. the tangent line, to approximate $\sqrt{25.4}$ as follows:
Let $f(x) = \sqrt{x}$. The equation of the tangent line to $f(x)$ at $x = 25$ can be written in the form $y = mx + b$ where m is: _____
and where b is: _____
Using this, we find our approximation for $\sqrt{25.4}$ is
NOTE: For this part, give your answer to at least 9 significant figures or use fractions to give the exact answer.

Answer(s) submitted:

-
-
-

(incorrect)

3. (1 pt) The linear approximation at $x = 0$ to $\sqrt{2 + 4x}$ is $A + Bx$ where A is: _____ and where B is: _____
Answer(s) submitted:

-
-

(incorrect)

4. (2 pts) If $f(x) = \frac{5}{x-2}$, find $f'(5)$.

_____

Use this to find the equation of the tangent line to the curve $y = \frac{5}{x-2}$ at the point $(5, 1.66667)$. The equation of this tangent line can be written in the form $y = mx + b$ where m is:
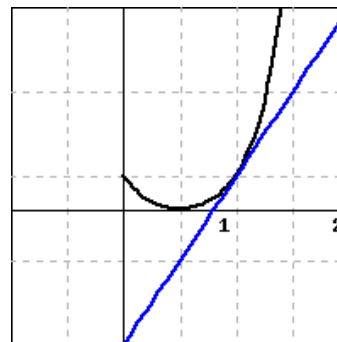_____

and where b is:_____

Answer(s) submitted:

-
-
-

(incorrect)

5. (2 pts) The figure below shows $f(x)$ and its local linearization at $x = a$, $y = 5x - 4$. (The local linearization is shown in blue.)

What is the value of a?
$a =$ _____
What is the value of $f(a)$?
$f(a) =$ _____
Use the linearization to approximate the value of $f(1.3)$.
$f(1.3) =$ _____
Is the approximation an under- or overestimate?
_____ (Enter **under** or **over**.)
Answer(s) submitted:

-
-
-
-

(incorrect)

6. (1 pt) Suppose $f'(x)$ is a differentiable increasing function for all x. In each of the following pairs, which number is the larger?
For each, enter **A** or **B**.
    1. Comparing A. $f'(3)$ and B. $f'(4)$: ___ is larger

2. Comparing A. $f''(3)$ and B. 0 : ___ is larger

3. Comparing A. $f(3+\Delta x)$ and B. $f(3)+f'(3)\Delta x$: ___ is larger

For each, make sure that you can explain why.

Answer(s) submitted:

-
-
-

(incorrect)

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7. (2 pts) A continuous function f, defined for all x, has the following properties:

1. f is decreasing
2. f is concave up
3. $f(11) = -2$
4. $f'(11) = -\frac{1}{5}$

Sketch a possible graph for f, and use it to answer the following questions about f.

A. For each of the following intervals, what is the minimum and maximum number of zeros f could have in the interval? *(Note that if there must be exactly N zeros in an interval, the minimum and maximum are both N.)*

	minimum	maximum
$-\infty < x \le 0$	___	___
$0 < x \le 1$	___	___
$1 < x < 11$	___	___
$11 \le x < \infty$	___	___

B. Are any of the following possible values for $f'(1)$? (Enter your answer as a comma-separated list, or enter 'none' if none of them are possible.) -3, -2, -1, $-\frac{1}{6}$, 0, $\frac{1}{6}$, 1, 2, 3.
possible values: $f'(1) = $ _____

C. What happens to f as $x \to -\infty$?
$\lim_{x \to -\infty} f(x) = $ _____
(Enter the value, 'infinity' or '-infinity' for ∞ or $-\infty$, or 'none' if there is no limit.)

Answer(s) submitted:

-
-
-
-
-
-
-
-
-

(incorrect)

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8. (2 pts) The temperature, H, in degrees Celsius, of a cup of coffee placed on the kitchen counter is given by $H = f(t)$, where t is in minutes since the coffee was put on the counter.

(a) Is $f'(t)$ positive or negative? $\boxed{?}$
(Be sure that you are able to give a reason for your answer.)

(b) What are the units of $f'(25)$? _____
(see the **units** cribsheet for correct units notation)

Suppose that $|f'(25)| = 0.4$ and $f(25) = 69$. Fill in the blanks (including units where needed) and select the appropriate terms to complete the following statement about the temperature of the coffee in this case.

At ___ minutes after the coffee was put on the counter, its $\boxed{?}$ is

_____ and will $\boxed{?}$ by about _____ in the next 30 seconds.

Answer(s) submitted:

-
-
-
-
-
-
-

(incorrect)

---

9. (3 pts) A laboratory study investigating the relationship between diet and weight in adult humans found that the weight of a subject, W, in pounds, was a function, $W = f(c)$, of the average number of Calories per day, c, consumed by the subject.

(a) In the statement $f(1700) = 155$
what are the units of 1700? _____
what are the units of 155? _____
(include **units**)
(Think about what this statement means in terms of the weight of the subject and the number of calories that the subject consumes.)

(b) In the statement $f'(2000) = 0$,
what are the units of 2000? _____
what are the units of 0? _____
(include **units**)
(Think about what this statement means in terms of the weight of the subject and the number of calories that the subject consumes.)

(c) In the statement $f^{-1}(162) = 2500$,
what are the units of 162? _____
what are the units of 2500? _____
(include **units**)
(Think about what this statement means in terms of the weight of the subject and the number of calories that the subject consumes.)

(d) What are the units of $f'(c) = dW/dc$? _____
(include **units**)

Answer(s) submitted:

-
-
-
-
-
-
-

(incorrect)

10. (1 pt) Suppose that $f(x)$ is a function with $f(130) = 28$ and $f'(130) = 3$. Estimate $f(128.5)$.

$f(128.5) =$ _____