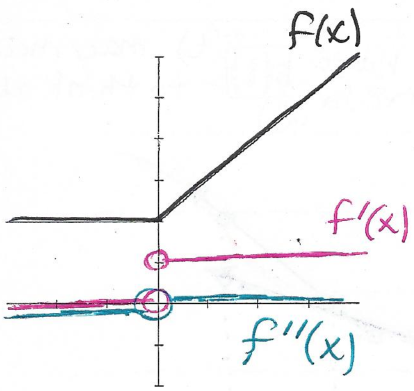
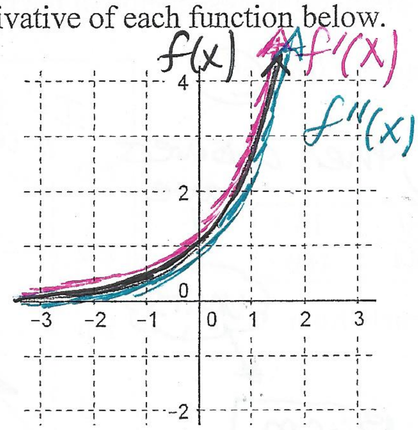
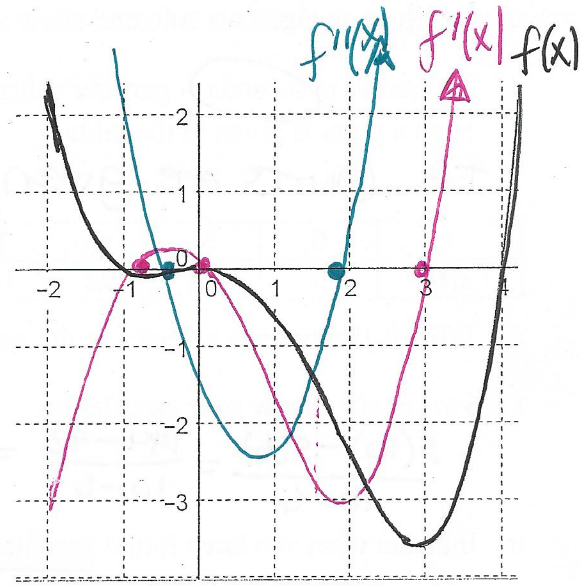
Chapter 2: Key Concept: The Derivative
Practice Test Name ANSWER KEY.

LT #5: I can sketch the graph of a derivative when given the graph of the function.

5. Sketch the first and second derivative of each function below.







LT #6: I can interpret the meaning of the function, the first derivative, and the second derivative at a point.

6. For some painkillers, the size of the dose, D, given depends on the weight of the patient, W. Thus, $D = f(W)$, where D is in milligrams and W is in pounds. WHAT – The Dosage or Size of Dose.

(A) Interpret the statements $\boxed{f(140) = 120}$ and $\boxed{f'(140) = 3}$ in terms of this painkiller.

- A person weighing 140 lbs will receive a dose of 120 mg of painkiller medication.
- For a 140 lb person, the painkiller dose is increasing at a rate of 3mg / 1 pound.

(B) What does the statement $\boxed{f''(140) = -0.5}$ tell you about this painkiller (in conjunction w/ $f'(140) = 3$ info)

For a 140 lb person, the painkiller dose is increasing at a decreasing rate of $-0.5 \frac{mg/lb}{lb}$ or $-0.5 \frac{mg}{lb^2}$

LT #7: I can sketch the graph of a function when given a description of the function in terms of continuity, differentiability and signs of the first and second derivatives.

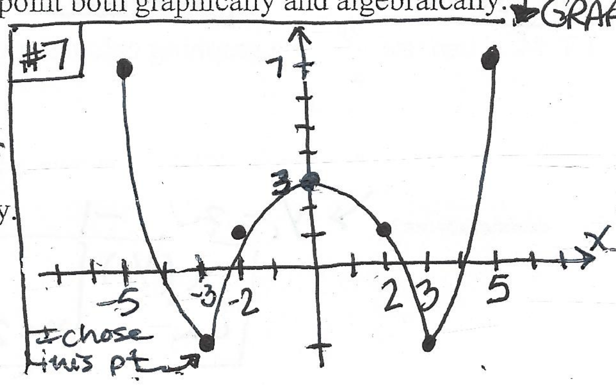
POINTS I KNOW TO PLOT

7. Sketch the graph of an $\boxed{\text{even}}$ function that is continuous on [-5,5] such that $\boxed{g(-2) = 1, g(0) = 3, \text{ and } g(5) = 7.}$
On [-5, -3] $\boxed{g'(x) < 0}$ and $\boxed{g''(x) > 0}$. On [-3, 0], $\boxed{g'(x) > 0}$ and $\boxed{g''(x) < 0}$.

$\boxed{g(2) = 1 \text{ \& } g(-5) = 7}$

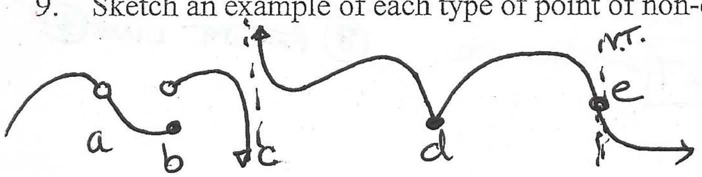
even function has symmetry to y-axis so f is decreasing & concave up on [-5, -3]. f is increasing & concave down on [-3, 0]

LT #8: I can state what it means for a function to be differentiable at a point both graphically and algebraically. GRAPH



8. List five types of points of non-differentiability.
- discontinuous points
  - holes (a)
  - jumps (b)
  - vertical asymptotes (c)
- sharp corner (d)
- vertical tangents (e)

9. Sketch an example of each type of point of non-differentiability.



Chapter 2: Key Concept: The Derivative

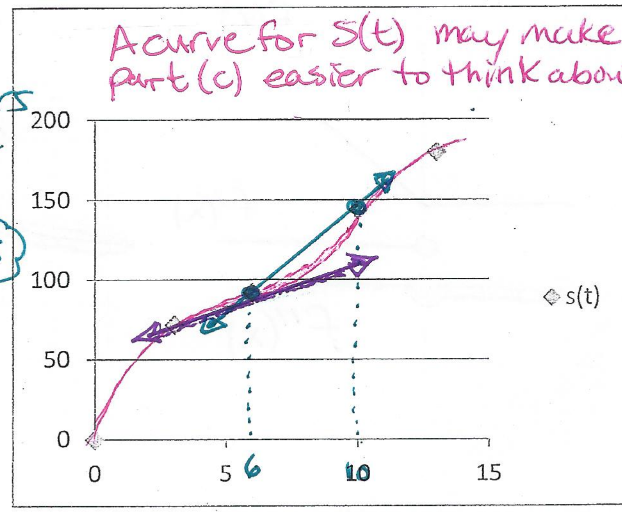
Practice Test Name ANSWER KEY

LT #1 and LT #3: I can calculate the average velocity or average rate of change on a given time interval using a table, a graph or an algebraic rule and show a graphical representation of the meaning of this calculation.

1. At time t in seconds, a particle's distance $s(t)$ in cm, from a point is given in the table.

If UNITS are given, then answers have UNITS

t	0	3	6	10	13
$s(t)$	0	72	92	144	180



a. What is the average velocity of the particle from $t = 6$ to $t = 10$? Show your calculation.

$$\frac{s(10)-s(6)}{10-6} = \frac{144-92}{10-6} = \boxed{13\ \frac{\text{cm}}{\text{sec}}}$$

b. Indicate what you have found graphically with a secant line. Secant line passes through 2 points (6,92) & (10,144)

c. Draw a slope segment on the graph to represent $s'(6)$ ⇒ $s'(6)$ represents the slope of the tangent line, so draw a tangent line at $t=6$... (again this is easier to do if there is an actual curve)

CALCULATIONS I NEED TO SEE IN BOXES

2. For $f(x) = \ln(x^2+7)$, what is the average rate of change of this function between $x = 1$ and $x = 3$.

Plug into $Y_1 = \ln(x^2+7)$ USE YOUR CALCULATOR EFFICIENTLY!

Show the calculation that leads to your answer. **Your answer should be accurate to 3 decimal places.**

Average Rate of Change = Average Velocity = Slope of secant.

$\boxed{(Y_1(3) - Y(1))/(3-1)} = \boxed{(f(3)-f(1))/2} = 0.34657 \therefore$ $\boxed{0.346}$ OR $\boxed{0.347}$

3. For $f(x) = \ln(x^2+7)$, what is the instantaneous rate of change of this function at $x = 2.5$? **Your answer should be accurate to 3 decimal places.**

INSTANTANEOUS RATE OF CHANGE = Instantaneous Velocity = Slope of Tangent at $x=2.5$

USE YOUR CALCULATOR EFFICIENTLY ⇒ MATH 8: nderiv(⇒ $\boxed{\left.\frac{d(Y_1)}{dx}\right|_{x=2.5}} = \boxed{0.377}$

LT #2: I can approximate instantaneous velocity or instantaneous rate of change at a given point using a table or an algebraic rule. I know how to use a graphing calculator efficiently for this type of calculation.

4. For $s(t) = 3e^t - 1$, find the average velocity between $t = 2$ and $t = 2 + h$ if

(Report answers accurate to three decimal places.)

a. $h = 0.1$	b. $h = 0.01$	c. $h = 0.001$
23.313	22.278	22.178

1. $Y_1 = 3e^x - 1$
2. 0.1 STO▶A
3. HOME SCREEN $\boxed{(Y_1(2+A)-Y(2))/A}$
4. ENTER
5. 0.01 STO▶A
6. REPEAT LINE 3
7. 0.001 STO▶A
8. REPEAT LINE 3

LT #4: I can use $\frac{dy}{dx}$ on a graphing calculator to find the slope of a curve at a point.

For $s(t) = 3e^t - 1$, what is $s'(2)$? (Use your graphing calculator and the tool: $\frac{dy}{dx}$.)

decimal places.)

$Y_1 = 3e^x - 1$ ✓ CALCULATION I MUST SEE

$\boxed{\left.\frac{d(Y_1)}{dx}\right|_{x=2}} = \boxed{22.167}$ ← ANSWER.