high 95.2%
mean 70.7%

100	90's	80's	70's	60's	<60
0	4	3	10	5	7

7:41
7:55

Test 1 A
Dusty Wilson
Math 151

Name: Key **Number:** IV

It is rare to find learned men who are clean, do not stink and have a sense of humour.

Gottleb Leibnez (1646 - 1716)
German mathematician

No work = no credit

No Sineful Calculators

Warm-ups (1 pt each): $-2^2 =$ -4 $\quad -1^0 =$ -1 $\quad 2+2=$ 4

1.) (1 pt) The quote (above) was said about Leibniz. What were two of his positive qualities?

He was clean & funny.

2.) (4 pts) Using the methods developed in the course, evaluate $\lim\limits_{x\to\infty} \dfrac{3x^2-2x+1}{4+5x-7x^2}$

$$\lim_{x\to\infty} \frac{3x^2-2x+1}{4+5x-7x^2} = \lim_{x\to\infty} \frac{3-\frac{2}{x}+\frac{1}{x^2}}{\frac{4}{x^2}+\frac{5}{x}-7} = -\frac{3}{7}$$

3.) (4 pts) Consider the function $f(x) = 4x^2-3x+5$. Use the definition of the derivative to find the derivative of f. Hint: You may check using the techniques of chapter 3.

$$f'(x) = \lim_{h\to 0} \frac{4(x+h)^2-3(x+h)+5-(4x^2-3x+5)}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{4x^2}+8xh+4h^2-\cancel{3x}-3h+\cancel{5}-\cancel{4x^2}+\cancel{3x}-\cancel{5}}{h}$$

$$= \lim_{h\to 0}(8x+4h-3)$$

$$= 8x-3$$

4.) (5 pts) Use the precise definition of the limit to prove $\lim_{x \to 4}(3x+2)=14$

claim: $\lim_{x \to 4}(3x+2)=14$

proof.

Let $\varepsilon > 0$ be given

choose $\delta = \frac{\varepsilon}{3}$

If $0 < |x-4| < \delta$

$\Rightarrow |x-4| < \frac{\varepsilon}{3}$

$\Rightarrow 3|x-4| < \varepsilon$

$\Rightarrow |3x-12| < \varepsilon$

$\Rightarrow |(3x+2)-14| < \varepsilon$

Hence $\lim_{x \to 4}(3x+2)=14$.

5.) (4 pts) Evaluate $\lim_{x \to 9} \frac{x-9}{\sqrt{x}-3}$, $\frac{\sqrt{x}+3}{\sqrt{x}+3}$

$= \lim_{x \to 9} \frac{\cancel{(x-9)}(\sqrt{x}+3)}{\cancel{x-9}}$

$= 6$

6.) (4 pts) Find the equation of the tangent line to $f(x)=x^2$ when $x=-3$. using any method,

point: $(-3, 9)$

slope: $f'(x) = 2x \Big|_{x=-3} \quad -6$

tangent line: $y-9 = -6(x+3)$

$\Rightarrow y = -6x - 9$

Test 1
Dusty Wilson
Math 151

Name: ______________________ **Number:** _____

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No Symbolic Calculators

1.) (4 pts) Evaluate $\lim\limits_{x\to\infty} \dfrac{\sqrt{16x^8+2x}-5}{2-3x^4}$ $= \lim\limits_{x\to\infty} \dfrac{\sqrt{16+\frac{2}{x^7}} - \frac{5}{x^4}}{\frac{2}{x^4} - 3} = \dfrac{4}{-3}$

2.) (5 pts) The table gives the values of *f* near 2, but not equal to 2. Use the table to estimate $\lim\limits_{x\to 2} f(x)$.

x	1	1.9	1.99	2	2.01	2.1	3
$f(x)$	0.7829	1.0858	1.1051	1.107	1.1092	1.1269	1.2565

↑ mid point.

3.) (5 pts) Consider the graph of *f* (right).

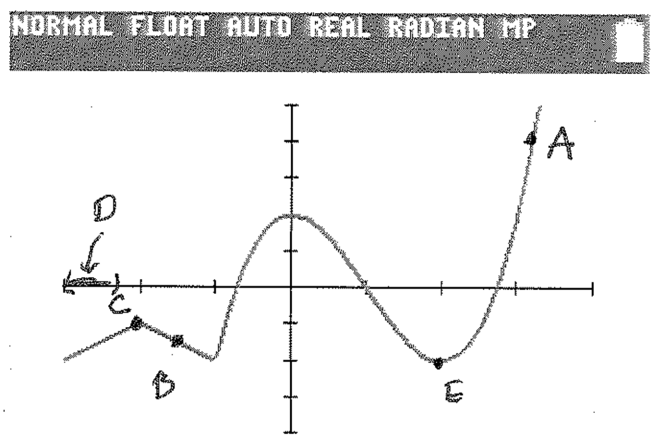
a.) Find and label a point A where f' is positive.

b.) Find and label a point B where f' is negative.

c.) Find and label a point C where f' is undefined.

d.) Find and label an <u>interval</u> D where *f* is constant.

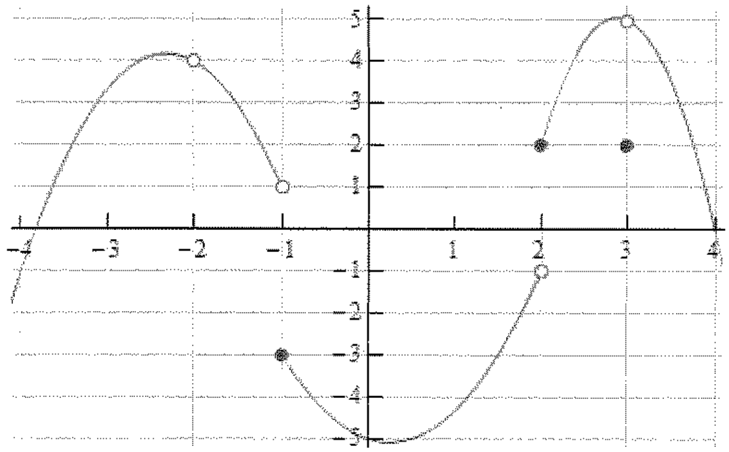
e.) Find and label a point E where f' is zero <u>and</u> is negative immediately to the left of E and positive to the right of E



4.) (4 pts) Consider the graph of g.

a.) For what value(s) a does $\lim_{x \to a} g(x)$ exist but g fail to be continuous?

$a = -2, 3$



b.) At what value(s) a is g continuous from the right?

$a = -1, 2$

5.) (3 pts) Suppose the height of a falling object after t seconds is given by the function $s(t) = 180 - 16t^2$ where the position is given in feet above the ground.

a.) Find and interpret $s(3)$ $= 36$

The object is 36 ft off the ground after 3 seconds.

b.) Use any method to find $s'(3)$

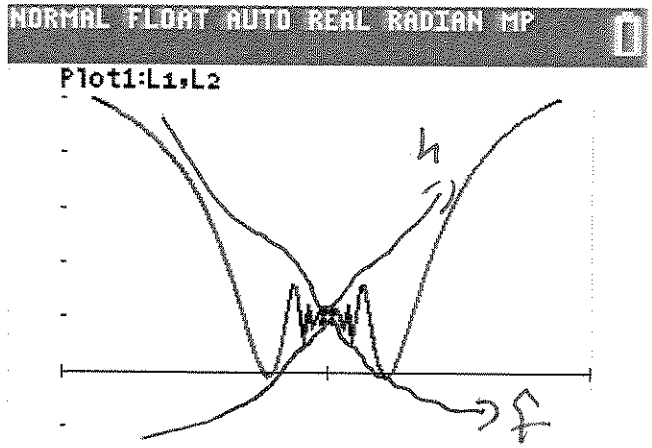
$s'(t) = -32t \Big|_{t=3}$ $\quad -96$

c.) Interpret $s'(3)$ including units

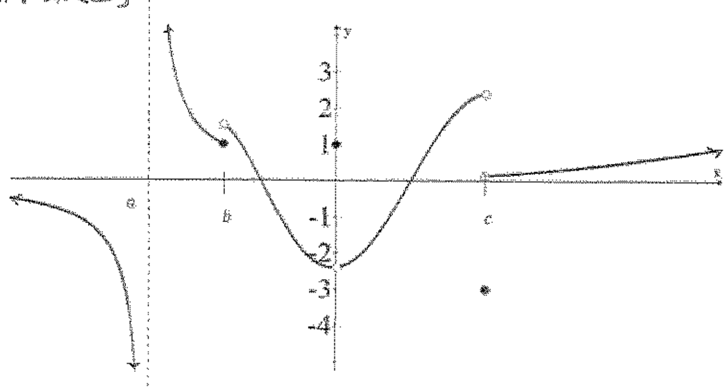
After 3 sec, the object is falling @ 96 ft/s

6.) (4 pts) Explain how you might use the Squeeze Theorem to prove that for the function g (pictured below) the $\lim_{x \to 2} g(x) = 1$

Find fcts f and h s.t. $f(x) \le g(x) \le h(x)$ near $x = 2$ w/ $\lim_{x \to 2} f(x) = \lim_{x \to 2} h(x) = 1$. This would prove $\lim_{x \to 2} g(x) = 1$ using the squeeze thm.



7.) (5 pts) Use the graph of g to answer the questions below.



a.) $\lim_{x \to 0} g(x) =$ -2.5 (estimate)

b.) Find $\lim_{x \to b^-} g(x) =$ 1

c.) Find $\lim_{x \to b} g(x) =$ DNE

d.) Find $\lim_{x \to -\infty} g(x) =$ 0

e.) Find $\lim_{x \to a^+} g(x) =$ ∞

Test 1B
Dusty Wilson
Math 151

Name: key **Number:** IV

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No Sineful Calculators

Warm-ups (1 pt each): $-2^2 =$ -4 $-1^0 =$ -1 $2+2=$ 4

1.) (1 pt) The quote (above) was said about Leibniz. What were two of his positive qualities?

He was clean & funny.

2.) (4 pts) Using the methods developed in the course, evaluate $\lim\limits_{x\to\infty} \dfrac{2x^3-2x+1}{4+5x-11x^3}$

$$\lim_{x\to\infty} \frac{2x^3-2x+1}{4+5x-11x^3} = \lim_{x\to\infty} \frac{2-\frac{2}{x^2}+\frac{1}{x^3}}{\frac{4}{x^3}+\frac{5}{x^2}-11} = -\frac{2}{11}$$

5.) (4 pts) Consider the function $f(x)=5x^2-7x+5$. Use the definition of the derivative to find the derivative of f. Hint: You may check using the techniques of chapter 3.

$$f'(x) = \lim_{h\to 0} \frac{5(x+h)^2-7(x+h)+5-(5x^2-7x+5)}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{5x^2}+10xh+5h^2-\cancel{7x}-7h+\cancel{5}-\cancel{5x^2}+\cancel{7x}-\cancel{5}}{h}$$

$$= \lim_{h\to 0} (10x+5h-7)$$

$$= 10x-7.$$

12

25

3.) (5 pts) Use the precise definition of the limit to prove $\lim_{x\to5}(3x+4)=19$

claim: $\lim_{x\to5}(3x+4)=19$

proof

Let $\varepsilon>0$ be given,

choose $\delta=\frac{\varepsilon}{3}$

If $0<|x-5|<\delta$

$\Rightarrow |x-5|<\frac{\varepsilon}{3}$

$\Rightarrow 3|x-5|<\varepsilon$

$\Rightarrow |3x-15|<\varepsilon$

$\Rightarrow |(3x+4)-19|<\varepsilon$

Hence $\lim_{x\to5}(3x+4)=19$

4.) (4 pts) Evaluate $\lim_{x\to4}\frac{x-4}{\sqrt{x}-2}\cdot\frac{\sqrt{x}+2}{\sqrt{x}+2}$

$=\lim_{x\to4}\frac{\cancel{(x-4)}(\sqrt{x}+2)}{\cancel{x-4}}$

$=4$

5.) (4 pts) Find the equation of the tangent line to $f(x)=x^2$ when $x=-4$ using any calculus method.

point

$(-4,16)$

slope

$f'(x)=2x\Big|_{x=-4}=-8$

tangent line

$y-16=-8(x+4)$

$\Rightarrow y=-8x-16$

13

Test 1B
Dusty Wilson
Math 151

No work = no credit

No Symbolic Calculators

Name: ______________________ Number: _____

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Gottleb Leibnez (1646 - 1716)
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1.) (4 pts) Evaluate $\lim\limits_{x\to\infty} \dfrac{\sqrt{25x^{10}+2x}-7}{2-4x^5}$ $= \lim\limits_{x\to\infty} \dfrac{\sqrt{25+\frac{2}{x^9}}-\frac{7}{x^5}}{\frac{2}{x^5}-4} = -\frac{5}{2}$

2.) (2 pts) The table gives the values of f near 2, but not equal to 2. Use the table to estimate $\lim\limits_{x\to 2} f(x)$.

x	1	1.9	1.99	2	2.01	2.1	3
$f(x)$	2.0174	2.3203	2.3396	2.342	2.3437	2.3614	2.491

3.) (5 pts) Consider the graph of f (right).

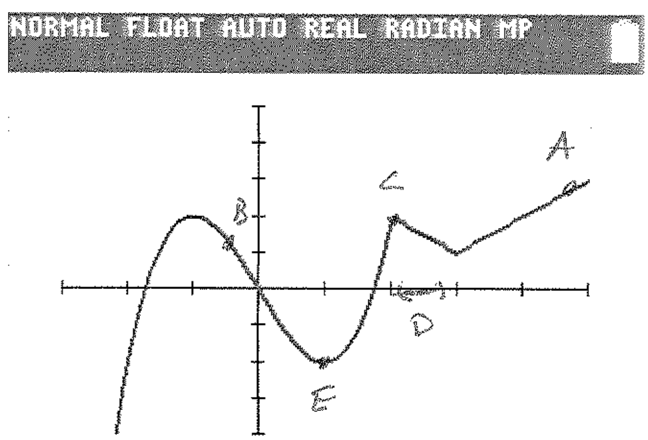
a.) Find and label a point A where f' is positive.

b.) Find and label a point B where f' is negative.

c.) Find and label a point C where f' is undefined.

d.) Find and label an <u>interval</u> D where f is constant.

e.) Find and label a point E where f' is zero <u>and</u> is negative immediately to the left of E and positive to the right of E.

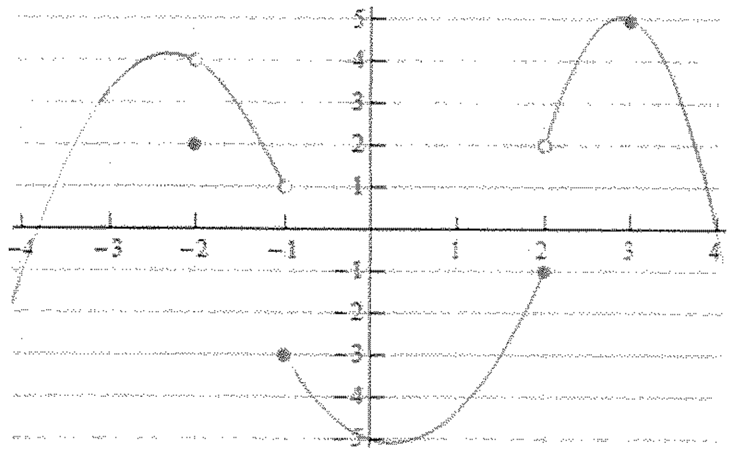


11

27

4.) (4 pts) Consider the graph of g.

a.) For what value(s) a does $\lim_{x \to a} g(x)$ exist but g fail to be continuous?



$a = -2$

b.) At what value(s) a is g continuous from the right?

$a = -1$

5.) (3 pts) Suppose the height of a falling object after t seconds is given by the function $s(t) = 80 - 16t^2$ where the position is given in feet above the ground.

a.) Find and interpret $s(2)$ $= 16$

The object is 16 ft up after 2 seconds

b.) Use any method to find $s'(2)$

$s'(t) = -\cancel{32}t \Big|_{t=2}$ -64

c.) Interpret $s'(2)$ including units

The object is falling @ 64 ft/s after 2 seconds.

7

6.) (4 pts) Explain how you might use the Squeeze Theorem to prove that for the function g (pictured below) the $\lim_{x \to 2} g(x) = -1$

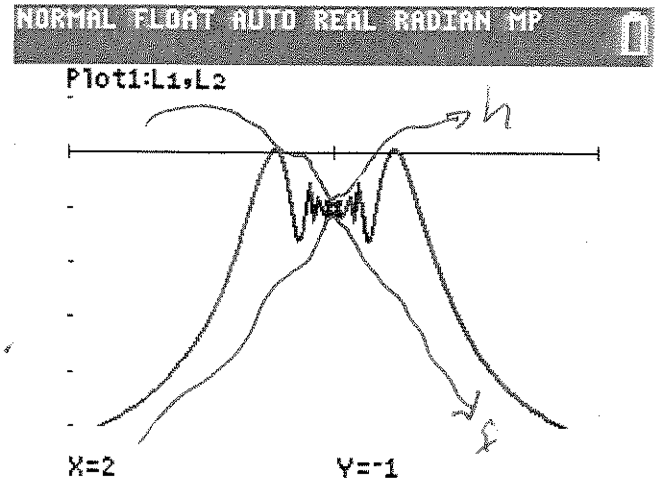
1 pts.

Find f & h s.t.

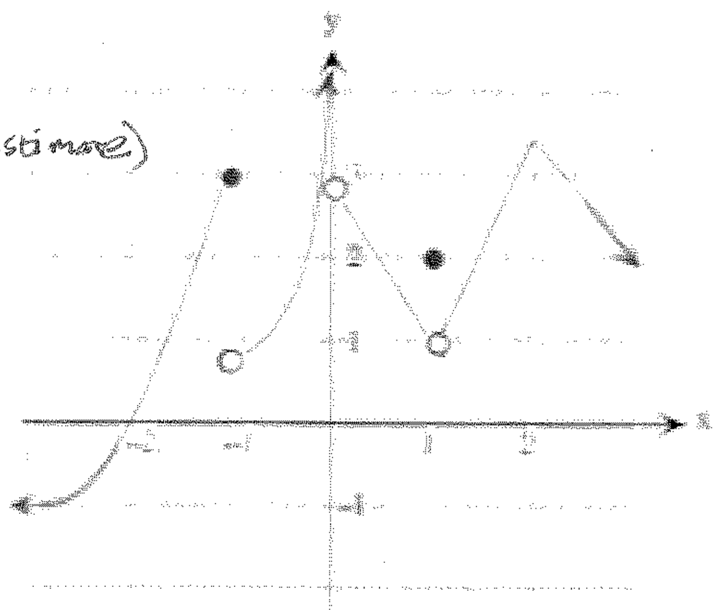
$f(x) \leq g(x) \leq h(x)$ near $x = 2$ and

$\lim_{x \to 2} f(x) = \lim_{x \to 2} h(x) = -1$.

This would prove $\lim_{x \to 2} g(x) = -1$ by the squeeze thm.



7.) (5 pts) Use the graph of g to answer the questions below.



a.) $\lim_{x \to 1} g(x) =$ 1

b.) Find $\lim_{x \to -1^+} g(x) =$ 0.75 (estimate)

c.) Find $\lim_{x \to 0} g(x) =$ DNE

d.) Find $\lim_{x \to -\infty} g(x) =$ -1

e.) Find $\lim_{x \to 0^-} g(x) =$ ∞