Math 157 - Test 1

September 21, 2016

Name _____

Score _____

Show all work to receive full credit. Supply explanations where necessary.

1. (8 points) Consider the data given in the following table.

x	1	2	4	7	10
y	5	2	-4	-13	-20

   (a) Could this data be representative of linear function? Show work.

   (b) Find an equation of the line that passes through the first two points, $(1, 5)$ and $(2, 2)$.

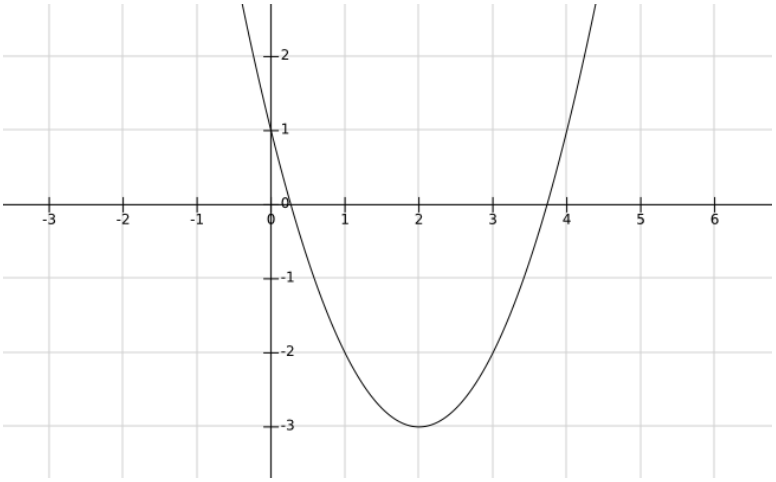
2. (9 points) An antique worth \$79 today is gaining value at 12.5% per year.

   (a) Determine the function of the form $P(t) = P_0 a^t$ that gives the value of the antique after t years.

   (b) What will be the value of the antique in 8.4 years?

   (c) Rewrite the function in the form $P(t) = P_0 e^{kt}$. (Determine P_0 and k.)

3. (8 points) The graph of the function $f(x) = x^2 - 4x + 1$ is shown below. Find the average rate of change of f over the interval from $x = 1$ to $x = 4$. Then illustrate your answer on the graph.



4. (6 points) $P = 80$ when $t = 5$ and $P = 30$ when $t = 2$. Find the values of the parameters k and P_0 so that $P(t) = P_0 e^{kt}$.

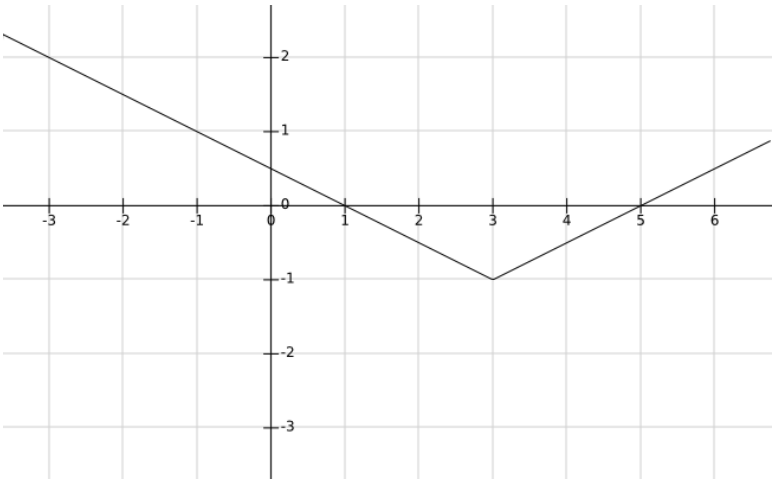
5. (6 points) Solve for t.

   (a) $e^{3t} = 100$

   (b) $58 = 17 \cdot 4^t$

6. (5 points) Determine the relative rate of change of $g(x) = 10e^{0.25x}$ over the interval from $x = 1$ to $x = 2$.

7. (6 points) The graph of the function f is shown below.



Determine each limit or explain why it does not exist.

(a) $\lim_{x \to 3} f(x)$

(b) $\lim_{x \to 0} f(x)$

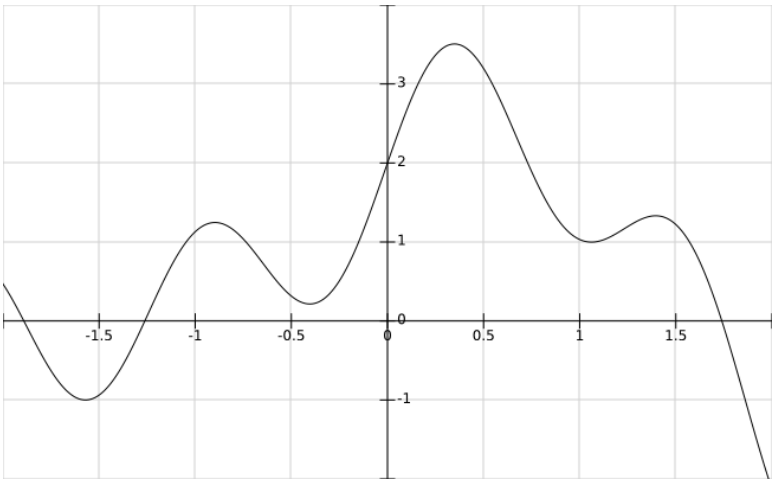
8. (6 points) Use algebra to find the limit.

$$\lim_{x \to 0} \frac{(x-5)^2 - 25}{4x}$$

9. (8 points) Let $g(x) = \ln x$. Use at least four small intervals to estimate $g'(5)$.

10. (5 points) The graph of the function f passes through the point $(2, 7)$, and at that point, $f'(2) = -5$. Find an equation for the tangent line at the point $(2, 7)$.

11. (10 points) The graph of the function f is shown below.



(a) If $f(1)$ positive or negative? How do you know?

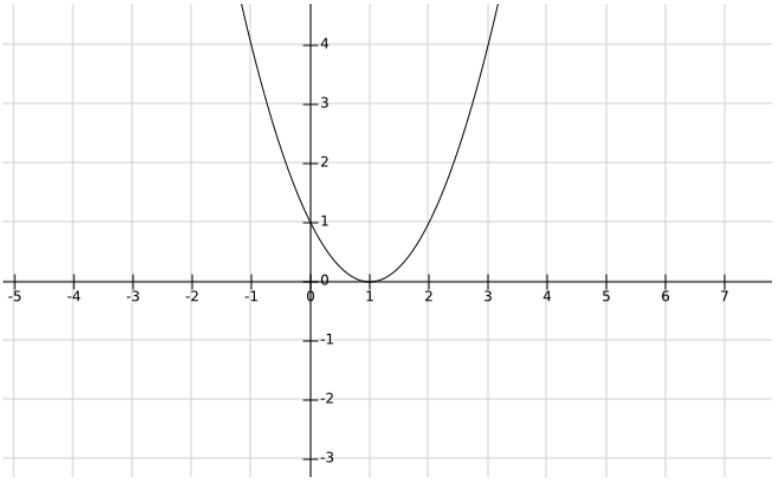
(b) If $f'(1)$ positive or negative? How do you know?

(c) Which is greater $f'(-1)$ or $f'(0)$? Explain your reasoning.

(d) At the point where $x = 1.5$, is the graph concave down or concave up?

(e) Is the value of $\dfrac{f(1.5) - f(1)}{1.5 - 1}$ positive, negative, or zero? How do you know?

12. (5 points) The graph of the function f is shown below. Sketch the tangent line at $x = 2$. Then use your tangent line to estimate $f'(2)$.



13. (6 points) Annual sales of music CDs have declined since 2000. Sales were 942.5 million in 2000 and 384.7 million in 2008.

    (a) Find a formula for the annual sales, S, in millions of CDs, as a linear function of the number of years, t, since 2000.

    (b) Use your function to predict CD sales in 2017.

    (c) Solve the equation $S(t) = 0$. What is the significance of your solution? (Use units when answering.)

14. (4 points) The table shown below gives values of the function h at selected points. Use the table to find a reasonable estimate for $\lim_{x \to 2} h(x)$.

x	$h(x)$
1.9	8.4573
1.99	8.4092
1.999	8.4001
2.1	8.3751
2.01	8.3952
2.001	8.3998

15. (4 points) The table shown below gives values of the function h at selected points. Explain why this table cannot be used to estimate $\lim_{x \to 0} h(x)$.

x	$h(x)$
-3	17.7
-2	13.4
-1	10.1
0	9.3
1	10.8
2	14.6

16. (4 points) The table shown below gives values of the function h at selected points. Use the table to find a reasonable estimate for $\lim_{x \to 1} h(x)$.

x	$h(x)$
0.9	3.4619
0.99	3.9012
0.999	3.9994
1.1	-3.3751
1.01	-3.8976
1.001	-3.9989