

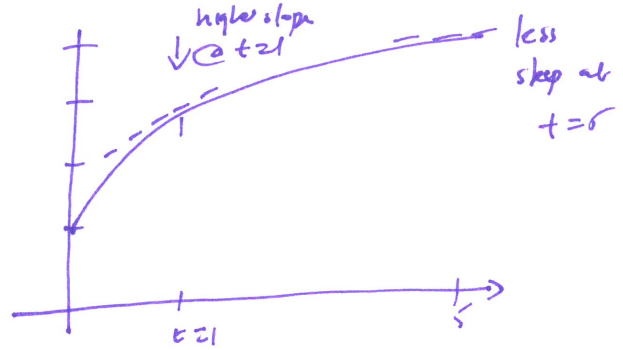
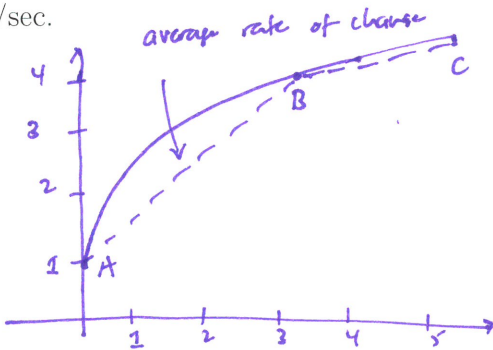
Name:
 Homework 4 solutions
 Math 151, Applied Calculus, Spring 2016

Section 2.1: 1,4,5,6,9,11,12,14,17,18,22

1. $f'(1950)$ is negative so the number of farms in the US is decreasing.

- 4a. (i) 8.4 m/sec.
 (ii) 8.04 m/sec.
 (iii) 8.004 m/sec.

4b. As we choose smaller and smaller intervals around $t = 1$, the average velocity is getting closer to 8 m/sec.



5a.

5b. We can see from the graph that the function is increasing faster at $x = 1$ than at $x = 4$. Therefore, the instantaneous rate of change at $x = 1$ is greater than at $x = 4$.

5c. The units of rate of change are thousands of dollars/kilogram.

6a. 7ft/sec.

6b. 4.1 ft/sec with interval size 0.1 and 4.01 ft/sec with interval size 0.01 so we can conclude that the instantaneous velocity is 4 ft/sec.

9. $g'(1) \approx 5.583$ with the interval $x = 1$ to $x = 1.01$ and $g'(1) \approx 5.549$ with the interval $x = 1$ to $x = 1.001$

11. The slope is positive at A and D; negative at C and F. The slope is most negative at A; most negative at F.

12. See class notes. This was an example in class.

14. (a) $f'(4)$ appears to be positive. The percentage of households with cable television is increasing at $t = 4$.

(b) $f'(2) \approx 0.24$. The percent of households with cable television is increasing at a rate of 0.24 million per year at $t = 2$.

$f'(10) \approx -1.958$ tells us that the percentage of households with television was decreasing at a rate of 1.958 million per year.

17. $A = (4, 25)$ $B = (4.2, 25.3)$ and $C = (3.9, 24.85)$.

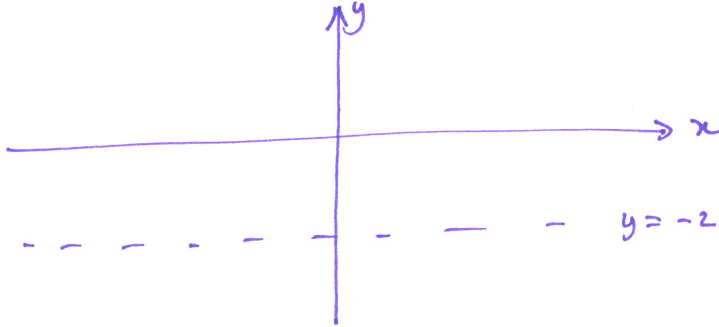
18. (a) $f(7) = 3$.

(b) $f'(7) = 4$.

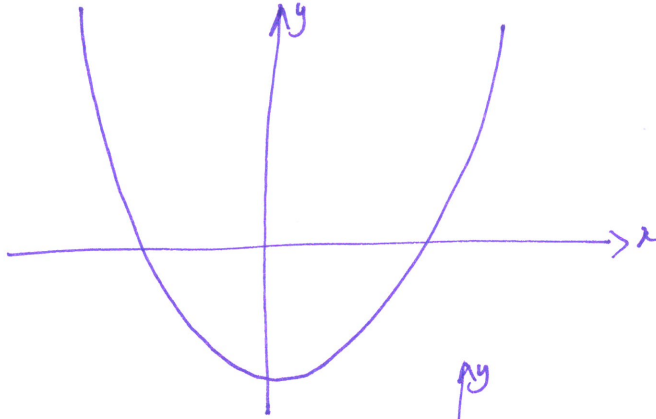
22. $f(0) = 300$ million $f'(0) = 2.867$ million people/year/

Section 2.2: 1,3,6,9,12,18-21,22

$y = -2x + 2$ the slope, and hence the derivative is -2 .



1.

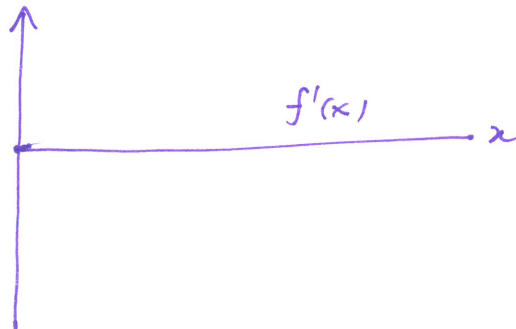


3.



6.

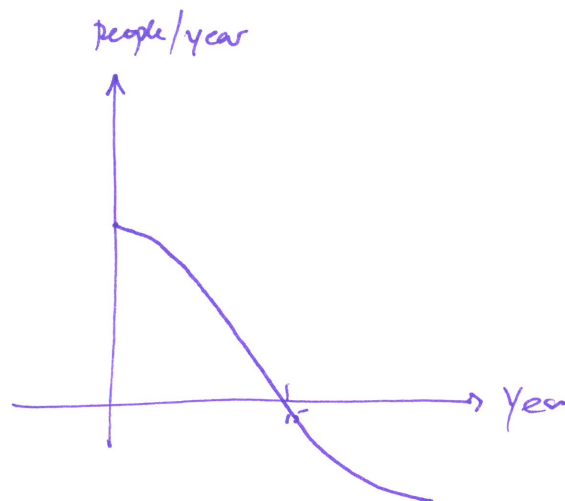
- 9. (a) x_3
- (b) x_4
- (c) x_5
- (d) x_3



12.

18. The matching derivative is VIII.

19. The matching derivative is *IV*.
 20. The matching derivative is *II*.
 21. The matching derivative is *VI*.



22.

Section 2.3: 7,10,11,14,16,17,22,28,30,31,42

7. (a) The statement $f(12) = 5$ means that when the weight of the chemical is 12 pounds, the cost is 5 dollars
 (b) We expect the derivative to be positive since we expect the cost of the chemical to increase when the weight bought increases.
 (c) The statement $f'(12) = 0.4$ means that the cost is increasing at a rate of 0.4 dollars per pound when the weight is 12 pounds, or that an additional pound will cost about an extra 40 cents.
10. $f'(4.3) \approx 55$.
11. (a) $f'(t)$ is negative because the yam is cooling off
 (b) Units are *degrees F/min*
14. (a) Investing \$1000 at 5% would yield \$1649 after 10 years.
 (b) We can write $g'(r)$ as $\frac{dB}{dr}$ so the units of $g'(r)$ are dollars per percent. $g'(5) \approx 165$ means that the balance, at 5% interest will increase by about 165 if the interest rate were increased by 1%.
16. (a) $f(1800) = 155$ means that consuming 1800 Calories per day results in a weight gain of 155 pounds.
 $f'(2000) = 0$ means that consuming 2000 calories per day causes neither weight gain nor loss.
 (b) The units of $\frac{dW}{dc}$ are pounds/(Calories per day)
17. (a) $f(200) = 1300$ means that it costs \$1300 to produce 200 gallons of chemical.
 (b) The statement $f'(200) = 6$ means that when the number of gallons produced is 200, costs are increasing at a rate of \$6 per gallon.
22. $f(26) \approx 3.4$ and $f(30) \approx 2.6$.
28. This was an example in class. See notes.
30. (a) $f'(5) = 0.64$ means that in 2010, US meat production increased by about 0.64 million tons in the next year.
 (b) In 2015 we expect the production to be about 95.83 tons.

31. (a) $f(20) = 0.36$ means that 20 minutes after smoking a cigarette, there will be 0.36 mg of nicotine in the body. $f'(20) = -0.002$ means that 20 minutes after smoking a cigarette, about 0.002 mg of nicotine leaves the body in the next minute. The units of the derivative are mg/minute.
- (b) $f(21) \approx 0.358$, and $f(30) \approx 0.34$.
42. (a) The company hopes that increased advertising brings in more customers so $f'(a)$ must always be positive.
- (b) $f'(100) = 2$ means that if the advertising budget is \$100,000, an extra dollar spent on advertising will bring in about \$2.00 worth of sales. If $f'(100) = 0.5$, then an extra dollar spent will bring in \$0.5 worth of sales.
- (c) If $f'(100) = 2$ then more should be spent on advertising because the increased revenue is more than being spent on advertising. However, if $f'(100) = 0.5$ less should be spent on advertising.

Section 2.5 – 1,2,6,8,11,12,13,14,15

1. $MC \approx 3$
2. (a) Marginal cost is the derivative $C'(q)$, so the units are dollars/barrel.
- (b) It costs \$3 more to produce 101 barrels of olive oil than to produce 100 barrels.
6. (a) 2200 dollars.
- (b) Change in profit is \$5.
8. The slope of the revenue curve is greater than the slope of the cost curve therefore the Marginal revenue is greater than the Marginal cost.
11. (a) \$4348.
- (b) \$11.
- (c) The company should not produce the 101st item because it will lose \$3.
12. The Marginal revenue is less than the Marginal cost, so no.
13. (a) 1.8 million dollars.
- (b) \$28,000
- (c) -\$35,000.
- (d) Decreasing production 0.05 million units decreases profits by about \$5000.
14. (a) \$1850.
- (b) 0.4 dollars
- (c) -0.45 dollars

q	0	1	2	3	4	5	6
$C'(q)$	1	2	3	4	5	6	7
$R'(q)$	5	5	5	5	5	5	5