Homework #8 math 211

Problems for Section 2.3

In Problems 1–4, write the Leibniz notation for the derivative of the given function and include units.

1. The cost, C, of a steak, in dollars, is a function of the weight, W, of the steak, in pounds.

3. An employee's pay, P, in dollars, for a week is a function of the number of hours worked, H.

7. An economist is interested in how the price of a certain item affects its sales. At a price of $\$p$, a quantity, q, of the item is sold. If $q = f(p)$, explain the meaning of each of the following statements:

(a) $f(150) = 2000$ **(b)** $f'(150) = -25$

9. The temperature, T, in degrees Fahrenheit, of a cold yam placed in a hot oven is given by $T = f(t)$, where t is the time in minutes since the yam was put in the oven.

(a) What is the sign of $f'(t)$? Why?
(b) What are the units of $f'(20)$? What is the practical meaning of the statement $f'(20) = 2$?

11. When you breathe, a muscle (called the diaphragm) reduces the pressure around your lungs and they expand to fill with air. The table shows the volume of a lung as a function of the reduction in pressure from the diaphragm. Pulmonologists (lung doctors) define the *compliance* of the lung as the derivative of this function.[10]

(a) What are the units of compliance?
(b) Estimate the maximum compliance of the lung.
(c) Explain why the compliance gets small when the lung is nearly full (around 1 liter).

Pressure reduction (cm of water)	Volume (liters)
0	0.20
5	0.29
10	0.49
15	0.70
20	0.86
25	0.95
30	1.00

31. A mutual fund is currently valued at \$80 per share and its value per share is increasing at a rate of \$0.50 a day. Let $V = f(t)$ be the value of the share t days from now.

(a) Express the information given about the mutual fund in term of f and f'.
(b) Assuming that the rate of growth stays constant, estimate and interpret $f(10)$.

Solutions

Section 2.3

1 dC/dW; dollars per pound

3 dP/dH; dollars per hour

5 (a) 12 pounds, 5 dollars
(b) Positive
(c) 12 pounds, 0.4 dollars/pound, extra pound costs about 40 cents

9 (a) Positive
(b) °F/min

11 (a) Liters per centimeter
(b) About 0.042 liters per centimeter
(c) Cannot expand much more

13 (a) Investing the \$1000 at 5% would yield about \$1649 after 10 years
(b) Extra percentage point would yield an increase of about \$165; dollars/%

15 (a) Consuming 1800 Calories per day results in a weight of 155 pounds; Consuming 2000 Calories per day causes neither weight gain nor loss
(b) Pounds/(Calories/day)

17 (a) Positive
(b) Child weighs 45 pounds at 8 years
(c) lbs/year
(d) The child is growing at a rate of 4 lbs/year at 8 years of age
(e) Decrease

19 $f'(t) \approx 6$ where t is retirement age in years, $f(t)$ is age of onset in weeks

21 (a) kg/week
(b) Growing at 96 gm/wk at week 24

23 (a) Less
(b) Greater

25 About 3.4, about 2.6

27 (a) In 2008: Net sales 5.1 bn dollars; rate increase 0.22 bn dollars/yr
(b) About 5.98 billion dollars

29 (a) Dose for 140 lbs is 120 mg
Dose increases by 3mg/lb
(b) About 135 mg

31 (a) $f(0) = 80$; $f'(0) = 0.50$
(b) $f(10) \approx 85$

33 (a) 1.7 (liters/minute)/hour
(b) About 0.028 liter/minute
(c) $g'(2) = 1.7$

35 (a) $f'(\alpha)$ is always positive
(c) $f'(100) = 2$: more
$f'(100) = 0.5$: less

37 (a) Fat
(b) Protein

39 (a) 2.0 kg/week
(b) 0.6 kg/week
(c) 0.3 kg/week

41 I-fat, II-protein

43 $f(4) = 200$ million users;
$f'(4) \approx 12.5$ million users/month;
Increasing at about 6.25%/month

45 0.50