Answer Key Prepared by Dr. Tabanli for March 135: Sections 13-15, 21-23

3.6: Derivative as rates of change

1. *Dr. G's Spring 2018 First Exam Problem*

   (a) The change in price is 1 dollar.

   (b) The average rate is 1 dollar per 10 weeks ($\frac{1}{10}$).

   (c) When the price of one pound of coffee was 7 dollars, the weekly demand was decreasing at a rate of 14 pounds per dollar. (-14)

   (d) (-4.2)

2. The velocity is -36 feet per seconds and speed is 36 feet per second when it hits the ground.

3.8: implicit differentiation and 3.9: log. differentiation

1. $-2 \cdot \pi$

2. (a) $\dfrac{dy}{dx} \approx -0.59$

   (b) When 81 dollars were spent on labor and 16 dollars were spent on capital, the money spent on capital decreased by about 59 cents for every dollar amount spent on labor.

3. $f'(x) = (1+x^2)^{\sin x} \cdot \left(\cos x \cdot \ln(1+x^2) + \dfrac{2x \cdot \sin x}{1+x^2} \right)$

3.11: related rates and applications

1. (a) $\dfrac{dL}{dt} = \dfrac{25\sqrt{5}(t-2)}{\sqrt{t^2-4t+20}}$

   (b) When $\dfrac{dL}{dt} = 0$, $t = 2$ hours.

2. *Dr. Tabanli's Fall 2018 Exam Problem*

   The radius is expanding at a rate of $\dfrac{3}{4}$ mm/s

4.6: linear approximation, marginal analysis

1. The revenue estimated from producing the 16th unit is ten dollars.

2. When the height changed from 59 to 60 in., the pulse is decreased by about 0.658 bpm.

4.7: l'Hôpital's rule

1. **True or False**

   L'ôpital's rule is the only method to evaluate the following limits:

   (a) No, because we do not obtain an indeterminate form when use DSP. The limit is 0.

   (b) No, because when the trinomial in the numerator is factored out, we can cancel out the denominator to obtain a polynomial - no more quotient form!. Use DSP to obtain the limit as 2.

   (c) Yes, we may use L.R. repeatedly to obtain the limit as $\frac{1}{10}$.

2. Evaluate the limit or determine that it does not exist. If the limit is infinite, then your answer should be ∞ or -∞ (as appropriate), instead of "does not exist". If you use the l'Hôpital's Rule, justify the use of it, state the indeterminate form used.

   (a) $\lim_{x\to 0}\left(\frac{x\cdot\tan x}{\sin 3x}\right) = 0.$

   (b) $\lim_{x\to\infty}\left(\frac{3+\ln x}{x^2+7}\right) = 0.$