Business Calculus
Review Worksheet
Summer 2008

Work out each problem. When you finish, find the answer listed on the back page and its corresponding letter. Fill in that letter for each space where you find the question number. Question number 1 is done as an example.

1. Find the derivative. $f(x) = 2.7x$

<div align="right">Answer: $f'(x) = $ __2.7__</div>

2. At what point is $f(x)$ discontinuous?

$$f(x) = \begin{cases} \frac{x-3}{(x-3)(x-4)} & \text{if } x \neq 3 \\ -1 & \text{if } x = 3 \end{cases}$$

<div align="right">Answer: At $x = $ _____</div>

3. Find $f'(0)$. $f(t) = \dfrac{\sqrt{3t+1}}{(t+2)^3}$

<div align="right">Answer: $f'(0) = $ _____</div>

4. Find the indicated limit, if it exists. $\displaystyle \lim_{x \to (-3)} \left(\frac{9x^2 - x^4}{7x^2 + 22x + 3} \right)$

<div align="right">Answer: The limit $= $ _____</div>

5. Find $f''(0)$ if $f(x) = \dfrac{5-x}{8x-3}$. Round your answer to the nearest tenth.

<div align="right">Answer: $f''(0) = $ _____</div>

6. If $\ln(x) = 6$ and $\ln(y) = 3$, find $\ln\left(\dfrac{x^{1/2} y^2}{x^{2/3}} \right)$.

<div align="right">Answer: $= $ _____</div>

7. A popsicle store's total daily revenue is $R(x) = 300x + 0.07x^2$ dollars, where x popsicles are sold in a day. Currently the store sells 100 popsicles a day, and is planning to decrease the daily output of popsicles by 0.75 . Use differentials to estimate the resulting change in total daily revenue.

<div align="right">Answer: $dR = $ _____</div>

8. The first and second derivatives of a function are $f'(x) = e^{3-x}(5x+2)$ and $f''(x) = e^{3-x}(3 - 5x)$. Find the open interval over which f is both increasing and concave up. The left endpoint of the interval is the answer for this question.

<div align="right">Answer: The left endpoint is $= $ _____</div>

1

9. Based on current production techniques, the rate of oil production from a certain oil well t days from now is estimated to be
$$R_1(t) = 100e^{0.05t}$$
barrels a day. Based on a new production method, however, it is estimated the rate could be
$$R_2(t) = 100e^{0.08t}$$
barrels a day. Determine how much additional oil will be produced over the next 10 days if the new technique is adopted. Round your answer to the nearest tenth.

Answer: Additional oil = _____ barrels.

10. Evaluate $\int_0^2 \frac{x}{x^2 + 1} dx$. Round your answer to the nearest tenth.

Answer: = _____

11. Evaluate $\int_1^4 x(2x^{-3} + x^{1/2}) dx$

Answer: = _____

12. A culture of bacteria that initially contained 2000 bacteria has a count of 18,000 bacteria after 2 hours. Determine the function $Q(t)$ that expresses the exponential growth of the number of cells of this bacterium as a function of time (t), then calculate the number of bacteria present after 4 hours.

Answer: $Q(4) =$ _____ bacteria

13. By cutting away identical squares from each corner of a rectangular piece of cardboard and folding up the resulting flaps, an open box may be made. If the cardboard is 20 in. long and 12 in. wide and the square cutaways have dimension x by x inches, what value of x will give the maximum volume for the box? Round to the nearest tenth.

Answer: $x =$ _____ inches

14. A particular company has a demand equation (price function) $p = 2x + 14$ and cost function $C(x) = x^2 + 34x - 220$. Find the resulting profit function and calculate what the maximum profit will be on the interval $[0, 24]$.

Answer: Maximum profit = _____

15. Find $f'(1)$ if $f(x) = (1 - 3x^2)^3 (\ln x + 2)^5$.

Answer: $f'(1) =$ _____

16. Evaluate the improper integral $\int_2^\infty \frac{dx}{(1 + 3x)^2}$

Answer: = _____

2

17. Records at Morrisville Hospital show that the length of time in days that a maternity patient stays in the hospital has a probability density function given by
$$P(t) = \frac{1}{4}e^{(-1/4)t}$$
What is the probability that a woman entering the maternity wing will be there less than 4 days? Round your answer to the nearest hundredth.

Answer: Probability = _____

18. Evaluate the definite integral $\int_1^2 \left(4e^{2u} - \frac{1}{u}\right) du$. Round your answer to the nearest tenth.

Answer: = _____

Answer	Letter	Answer	Letter
2.7	G	3.6	A
11	B	-2944	N
-0.45	Z	43	C
-2/5	R	0.63	S
14.5	I	0.8	A
4/7	H	5664	E
4	O	9	R
2.4	P	162,000	T
-7	S	1/16	V
0	V	-2	Y
234.5	F	3.3	M
47.8	A	5	N
13.9	T	-2.7	E
-120	O	192	J
1/21	T	5.6	L
-235.5	O	-1/8	U
89.34	R	316	A
93.7	L	-21.9	R

$\overline{1}$ $\overline{2}$ $\overline{3}$ $\overline{4}$ $\overline{5}$ $\overline{6}$ $\overline{7}$ $\overline{8}$

$\overline{9}$ $\overline{10}$ $\overline{11}$ $\overline{12}$ $\overline{13}$ $\overline{14}$ $\overline{15}$ $\overline{16}$ $\overline{17}$

$\overline{18}$

Number 18 is not actually part of the name, but it is a good question for you to do anyway.