Business Calculus–Review Worksheet
Fall 2014, Dr. Graham-Squire

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. $f(x) = 2.7x$

   Answer: $f'(x) = \underline{\ 2.7\ }$

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

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

   Answer: At $x =$ _____

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

   Answer: $f'(0) =$ _____

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

   Answer: The limit = _____

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

   Answer: $f''(0) =$ _____

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

   Answer: = _____

7. Dominic is excited to fly his new kite, but it is not windy outside. Instead, Dominic attaches his kite to a pole and runs around with it to act like it is flying, while Eva holds onto the spool to let out the kite string. Supposing that Dominic holds the kite at a constant 10 feet high, and he runs in a straight line (away from Eva) at a speed of 6 feet per second, how fast is the kite string coming out of the spool when Dominic is 20 feet from Eva?

   Answer: kite string is coming out at a rate of = _____ feet/sec

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.

   Answer: The left endpoint is = _____

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 $f(x) = \left(1 - 3x^2\right)^3 (\ln x + 2)^5$.

Answer: $f'(1) =$ _____

16. Use the definition of the derivative and the 4-step process to calculate $f'(x)$ if $f(x) = x^2 - 3x$.

Answer: $f'(0) =$ _____

17. Find the absolute maximum of $f(x) = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 2x + 11$ on the interval $[0, 4]$. Round your answer to the nearest 0.01.

Answer: Absolute max=_____

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

Answer: = _____

19. Let $3x^4 - x^2y^2 - y^{-3} = 1$. Use implicit differentiation to find y', then evaluate y' at the point (1,1).

Answer: = _____

20. The demand function for a Elf-On-The-Shelf elf is given by

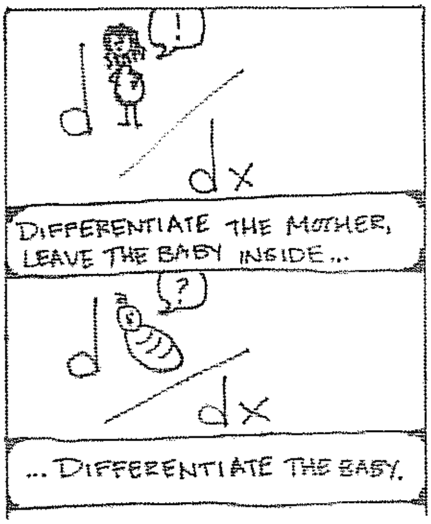
$$p = D(x) = 8.25 - x^2$$

where p is the unit price in dollars and x is the quantity demanded in thousands of elves. The supply function for the elves is given by

$$p = S(x) = \frac{8x^2}{25}$$

with p and x as above. Determine the producers' surplus if the market price is set at the equilibrium price.

Answer: Producers' surplus= $_____



Answer	Letter	Answer	Letter
2.7	H	3.6	A
11	B	-2944	E
-0.45	Z	43	C
-2/5	R	16.33	I
14.5	I	0.8	D
4/7	H	5664	E
4	O	9	R
2.4	C	162,000	H
-7	S	1/16	V
0	W	-2	Y
234.5	N	3.3	M
47.8	A	5	E
13.9	T	-2.7	I
-120	O	192	J
-3	A	5.6	L
5.4	A	-1/8	U
89.34	R	316	U
93.7	N	-21.9	L
-45.2	X	-10	R
3333.33	L	-127.5	E

This is the caption for the comic above.

H

$\overline{1}$ $\overline{2}$ $\overline{3}$ $\overline{4}$

$\overline{5}$ $\overline{6}$ $\overline{7}$ $\overline{8}$ $\overline{9}$ $\overline{15}$ $\overline{10}$ $\overline{11}$ $\overline{12}$ $\overline{6}$

$\overline{13}$ $\overline{12}$ $\overline{16}$ $\overline{17}$ $\overline{8}$ $\overline{19}$ $\overline{14}$ $\overline{20}$ $\overline{15}$