# Math 1410 - Calculus I

Final Exam Review Worksheet
Spring 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 0.5 is done as an example.

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

Answer: $f'(x) =$ 2.7

1) Compute the derivative of $y = 2^{\tan(x)}$ and evaluate it at $x = \frac{\pi}{4}$.

Answer: _______

2) Find the exact value of $c$ so that $f$ is continuous at $x = 2$, where

$$f(x) = \begin{cases} \dfrac{x^3 - 4x}{3x - 6} & \text{if } x < 2 \\ \sqrt{cx} & \text{if } x \geq 2 \end{cases}$$

Answer: $c$=_______

3) Use differentials to approximate the value of $\ln(0.76)$. Hint: what is a number near 0.76 for which it is easy to calculate ln?

Answer: $\ln(0.76) \approx$ _______

4) Use the limit definition of the derivative to compute $f'(x)$ for $f(x) = \dfrac{2x+1}{3-x}$. For what value(s) of $x$ is the function $f'(x)$ discontinuous?

Answer: $x =$_______

5) Let $f(x) = e^{-x}(4x^2 + 20x + 29)$. Find the $x$ values at which the tangent line to the graph of $f$ is horizontal.

Answer: The fractional value for $x =$_______

6) $G(x) = f(g(x)) + f'(x)g(x)$. Assume, $g(2) = 2$, $g'(2) = 3$, $f(2) = 1$, $f'(2) = -1$, and $f''(2) = 3$. Find $G'(2)$.

Answer: $G'(2) =$_______

7) Use the limit definition of the derivative to compute $f'(6)$ for the function $f(x) = \sqrt{3x-2}$.

Answer: _______

8) Without using L'Hospital's rule, compute the following limit:

$$\lim_{x\to\infty} \frac{3x^6 + 4x^3 + 7}{9x^6 + 2x^4 + 3x^2 + 5}$$

Answer: _______

9) Use calculus to find the slope of the curve $2x - 4y^2 = xy^2 - 3$ at the point $(1, 1)$.

Answer: _______

10) A particle is moving along a horizontal line. Its position function is given by $s(t) = t^3 - 5t^2 + 10t + 15$. What is the $t$ value that marks the left endpoint of the interval on which the function has both positive acceleration and is moving to the right?

Answer: _______

11) The temperature in a town in Alaska in modeled on the equation $d(t) = \frac{2}{3}t^3 - t^2 - 24t$ where $t$ is in hours and $t = 0$ is noon. For the time interval $[-5, 5]$, find the lowest temperature reached.

Answer: _______

12) Calculate the limit: $\lim\limits_{x\to 0^+} (\cos x)^{\frac{1}{x^2}}$

Answer: _______

13) A woman standing on a boat is looking through a telescope at the top of a cliff 240 feet above sea level. As the boat approaches the cliff, she must increase the angle of the telescope to keep it focused on the top of the cliff. Assuming the boat is approaching in a straight line at 50 feet/second, at what rate is the angle (in radians) of the telescope increasing when the boat is 100 feet from the cliff? (Round your answer to 2 decimal places)

Answer: _______ $\frac{radians}{second}$

14) A right triangle with a hypotenuse 9 inches long is rotated about one of its legs to generate a right circular cone. Find the height of such a cone so that the volume of the cone is maximized. (Note: volume of a cone is $V = \frac{1}{3}\pi r^2 h$)

Answer: height=_______

15) A particle traveling on a number line has a velocity function given by $v(t) = \sin t$. Calculate the total distance traveled by the particle on the interval $[-\pi/2, 2\pi]$.

Answer: total distance=_______

16) If $f''(\theta) = \sin\theta + \cos\theta$, $f(0) = 3$, and $f'(0) = 4$, find $f(\theta)$ and then $f(\pi)$.

Answer: $f(\pi)$=_______

17) Use right endpoints and 3 subintervals to find an approximation for the area under the curve $(x^2 + 2)$ on the interval $[0, 6]$.

Answer: _______

18) Calculate $\displaystyle\int_1^4 (-x^2 + 5x - 4)dx$.

Answer: _______

19) Let $g(x) = \displaystyle\int_{x^2-1}^{5} \ln(e + t^3)\, dt$. Use the FTC to calculate $g'(x)$, then find $g'(1)$.

Answer: $g'(1) =$ _______

20) Evaluate the definite integral $\displaystyle\int_1^4 \frac{(\sqrt{x}+1)^8}{\sqrt{x}}\, dx$. (Round answer to nearest whole number)

Answer: _______

21) Find the equation for the tangent line at $t = 0$ for the parametric curve $x = \cos t + \sin(2t)$, $y = \sin t + \cos(2t)$.

Answer: Slope of the tangent line=_______

To find out what the man is saying to the (cat)woman, fill in the blanks below.


| Answer | Letter | Answer | Letter |
|---|---|---|---|
| 2.7 | Y | 3.6 | A |
| 11 | B | 0 | J |
| -0.45 | Z | $3\sqrt{3}$ | Y |
| $5\pi$ +5 | R | 0.6 | S |
| 3 | O | $1/\sqrt{e}$ | K |
| ln(16) | O | 124 | P |
| 4 | K | 9 | R |
| 2.47 | P | 5/3 | L |
| 1/3 | S | -2 | F |
| 3/8 | U | -0.24 | L |
| 234.5 | F | 9/2 | R |
| 47.8 | A | 5 | O |
| -208/3 | I | 16/9 | U |
| -120 | O | 192 | J |
| 1/21 | T | 0.18 | E |
| 1/10 | T | 1/2 | C |
| 89.34 | R | 4260 | I |
| -3/2 | K | 21.9 | R |

$\overline{0.5}\ \ \overline{1}\ \ \overline{2}\qquad \overline{3}\ \ \overline{4}\ \ \overline{4}\ \ \overline{5}\qquad \overline{6}\ \ \overline{7}\ \ \overline{8}\ \ \overline{9}$

$\overline{10}\ \ \overline{11}\ \ \overline{12}\ \ \overline{13}\qquad \overline{14}\ \ \overline{15}\ \ \overline{7}\ \ \overline{16}$

$\overline{17}\ \ \overline{18}\ \ \overline{15}\ \ \overline{19}\ \ \overline{20}\ \ \overline{10}\ \ \overline{13}\qquad \overline{17}\ \ \overline{11}\ \ \overline{21}\ \ \overline{9}\ \ \overline{7}\ \ \overline{16}\ \ \overline{13}$