

Name: _____
Math 151, Calculus I – Crawford

Exam 1
24 September 2019

Score

1	/10
2	/14
3	/8
4	/16
5	/14
6	/10
7	/10
8	/10
9	/4
10	/6
Total	/100

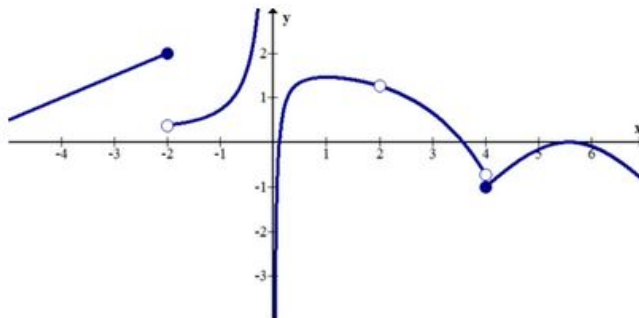
- Calculators, books, notes (in any form), cell phones, and any unauthorized sources are ***not*** allowed.
- You may use the given Unit Circle.
- Clearly indicate your answers.
- ***Show all your work*** – partial credit may be given for written work.
- ***Good luck!***

1. (10 pts). Find the domain of $f(x) = \sqrt{8x - 2x^2}$.

2. (14 pts). Evaluate the following limits, if they exist. Clearly indicate $+\infty$ or $-\infty$ in the case of an infinite limit. If the limit does not exist, **clearly explain the reason why.**

(a). $\lim_{x \rightarrow 2} \frac{x^2 - 2x}{x^2 + 3x - 10}$

(b). $\lim_{x \rightarrow 9} \frac{\sqrt{x} - 3}{x - 9}$



3. (8 pts). Given the graph of $f(x)$ above,

(a). Is f continuous from the right at $x = -2$?

(b). State which type of discontinuity is at $x = 2$.

(c). Explain why the function is discontinuous at $x = 2$. i.e., Explain which of the three conditions from the definition of continuity do not hold. [Stating what type of discontinuity is not sufficient.]

(d). Is f differentiable at $x = 2$?

4. (16 pts). The position of a particle at time t seconds is given by $s(t) = \frac{12}{3+t}$ cm.

(a). Find the average velocity of the particle over the time interval $[1, 3]$. [Include units in your answer.]

(b). **Use the limit definition** $v(a) = \lim_{t \rightarrow a} \frac{s(t) - s(a)}{t - a}$ or $v(a) = \lim_{h \rightarrow 0} \frac{s(a+h) - s(a)}{h}$ to find the instantaneous velocity when $t = 1$.

[Include units in your answer.]

You must use the limit definition and you must show all of your work.

[Note: $s'(t) = v(t) = -\frac{12}{(3+t)^2}$, if you want to check your answer.]

For the remainder of the test, use the DIFFERENTIATION RULES to find any needed derivatives.

Do **NOT** use the limit definition.

5. (14 pts). Differentiate the following using Differentiation Rules. Do **NOT** use the limit definition!

[Do not simplify.]

(a). $y = 5x^4 + \frac{1}{3}x + x\sqrt{x}$

(b). $f(x) = (x^2 + 4x - 3)\cos x$

6. (10 pts). Find the first and second derivatives of $g(\theta) = \sec \theta$.

7. (10 pts). Find an equation of the tangent line to $y = \frac{x^2 - 1}{x + 2}$ when $x = 2$.

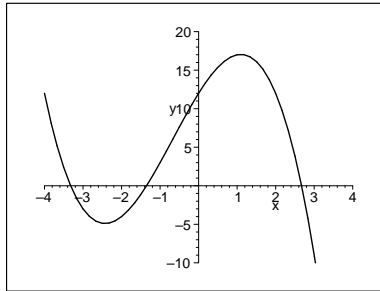
8. (10 pts). Solve the following equation for all x .

$$\cos^2(x) - \frac{1}{4} = 0$$

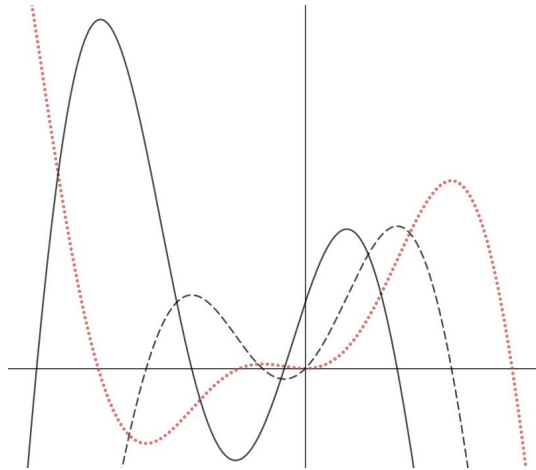
9. (4 pts). *True or False.* Clearly indicate whether the following statements are true or false.

T F If $f(1) < 0$ and $f(4) > 0$, then there exists a number c in $(1, 4)$ such that $f(c) = 0$.

T F If the graph of a function $y = f(x)$ is given below, then the derivative $f'(2) > 0$.



10. (6 pts). The figure below shows the graph of f , f' , and f'' . Match the solid, dashed, and dotted curves to the correct function f , f' , or f'' .



[Fill in the blank with f , f' , or f'' .]

Solid: _____

Dashed: _____

Dotted: _____