

NAME: _____

TQS 124

CALCULUS & ANALYTIC GEOMETRY
EXAM # 1

Winter 2008

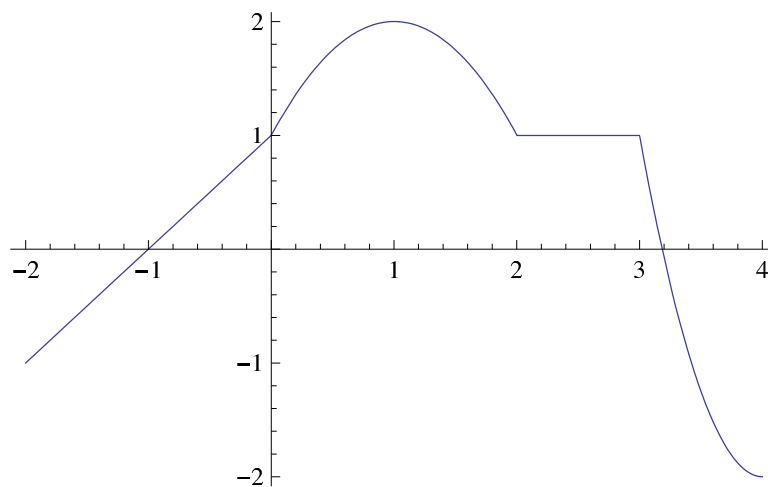
Read through the entire test before beginning. Make sure you have 10 (plus one bonus) questions on 6 pages. You may use your calculator and ask me questions if you find a problem unclear. Please be sure to show your work. *Unsupported answers will be counted as minimally correct.*

If you have time and the inclination, please consider filling out the *Reality Check*. I am asking you to reflect on how well you think you did on the exam. The student(s) who guess(es) closest to their actual score will be given a 2 point bonus. (If you know your score exactly, the bonus increases to 3 pts.)

Good luck and remember—you know quite a lot. Rely on your instincts and common sense. If something doesn't seem right, ASK! If you have no idea how to get started on a problem, ASK! If you are stuck, ASK! The worst thing that can happen is I look at you and say "You should know that."

Problem	Grade	Reality Check	Points
1			10
2			15
3			10
4			25
5			10
6			10
7			10
8			10
Bonus			5+5
Total	/100	/100	110

1. The graph of the function $f(x)$ is given below. Sketch the graph of $-f(x+2)$ on the same set of axes. (/10)



2. Suppose $f(x) = \cos(x)$ and $g(x) = 2^x - x$. Find the following: (/15)

(a) $f \cdot g$

(b) $f \circ g$

(c) $g(f^{-1}(0))$

3. If $f(x) = x^2 - 3x + 5$, evaluate and simplify the difference quotient $\frac{f(a+h) - f(a)}{h}$. (/10)

4. **Assigning a value to 0^0 .** The laws of exponents tell us that $a^0 = 1$ if a is any number different from zero. They also tell us that $0^n = 0$ if n is any positive number. So what should the following limits be? Fully explain your answer. (/25)

(a) $\lim_{a \rightarrow 0^+} a^0$

(b) $\lim_{n \rightarrow 0^+} 0^n$

(c) $\lim_{x \rightarrow \infty} \frac{1}{x}$

(d) $\lim_{x \rightarrow \infty} \frac{1}{\ln x}$

(e) $\lim_{x \rightarrow \infty} \left(\frac{1}{x}\right)^{\frac{1}{\ln x}}$

(f) **Bonus Question.** Can you explain your findings for the limit above in (4e) analytically rather than numerically?

(/5)

5. Describe the difference between a discontinuity that is removable and one that is nonremovable. In your explanation, give examples of the following descriptions. (/10)
- (a) function with a nonremovable discontinuity at $x = 2$
 - (b) a function with a removable discontinuity at $x = -2$
 - (c) a function that has both the characteristics describe in (5a) and (5b) above.

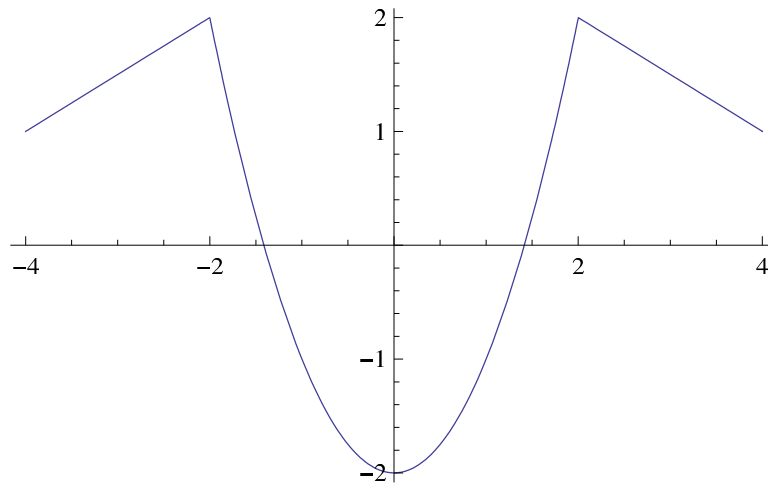
6. Find the equation of all vertical and horizontal asymptotes for

$$y = f(x) = \frac{2 + x}{2 - x}.$$

(/10)

7. (a) State the Intermediate Value Theorem. (/10)
- (b) Verify that the Intermediate Value Theorem applies to $f(x) = x^2 + x - 1$ on the interval $[0, 5]$ with $f(c) = 11$.
- (c) Find the value of c where $f(c) = 11$ that is guaranteed to exist by the Intermediate Value Theorem.

8. Given the function below, sketch the graph of it's derivative function. (/10)



- * **Bonus Question.** Explain one mathematical topic that you studied to prepare for this examination but feel you did not get the opportunity to adequately show your knowledge. (/5)