

Test Total

Name _____

Exam 1 Calculus I HONORS SECTION, Kreider
25 Sep 2002 For full credit, show your work and use correct notation

1. Evaluate $L = \lim_{x \rightarrow 0} \frac{x^4 + 9x^3 + 2}{x^2 - 5x - 7}$. Show your algebraic work.

1: 6 pts

2. Evaluate $L = \lim_{x \rightarrow 3} \frac{x^2 - 10x + 21}{x^2 - x - 6}$. Show your algebraic work.

2: 8 pts

3. A machinist is required to make a circular disk of area $25\pi = 78.5398 \text{ cm}^2$, which requires a radius of exactly 5 cm. (a) If the error tolerance for the area is $\pm 2 \text{ cm}^2$ (ie, the area is 78.5398 ± 2), find the **range of radii** (smallest and largest radii) that a disk might have and still have an acceptable area. The area of a circle is $A = \pi r^2$.

3a: 6 pts

(b) In terms of the generic definition of a limit, $\lim_{x \rightarrow a} f(x) = L$, identify numerical values for ϵ , δ , a and L .

3b: 4 pts

4. Differentiate $f(x) = \frac{9}{48}x^{-12/19} - \frac{1}{\sqrt{x}} + x^{287} + \pi^3$.

4: 7 pts

Pg 1 Tot (31)

5. Let $f(x) = \begin{cases} 2x + 4, & \text{if } x < 2; \\ k, & \text{if } x = 2 \text{ (} k \text{ will be determined in parts b and c);} \\ 3x - 8, & \text{if } x > 2; \end{cases}$

a) State the formal definition of the continuity of a function f at the point $x = a$.

5a: 3 pts

b) What value of k should be used to make f continuous from the left at $x = 2$ (note that $f(2) = k$)?

5b: 3 pts

c) What value of k should be used to make f continuous from the right at $x = 2$ (note that $f(2) = k$)?

5c: 3 pts

6. Use the Intermediate Value Theorem to show that $f(x) = x^5 - 7$ has at least one real root. Find an interval in which the root lies, and be sure to verify that each hypothesis of the Theorem is satisfied.

6: 7 pts

7. Differentiate $g(r) = \frac{r^5 + 2r}{r^4 + 1}$. Simplify the numerator.

7: 8 pts

Pg 2 Tot (24)

Name _____

8. My kids Max and Mikayla like to throw toys around at home. One day, Mikayla grabs a Tonka truck and *accidentally* tosses it out an open window. The truck's height above the ground is given by $h(t) = 15 + 2t - 16t^2$ feet after t seconds. (a) At what time does the truck hit the ground? Report the answer using 2 digits after the decimal. (b) At the instant of impact, what is the truck's instantaneous velocity? Use *any* appropriate method to compute the velocity.

8: 10 pts

9. Draw a sketch of a function that has a removable discontinuity at $x = 1$, a jump discontinuity at $x = 2$ and is continuous from the left there, a jump discontinuity at $x = 3$ and is continuous from the right there, an infinite discontinuity at $x = 4$, a jump discontinuity at $x = 5$ without being continuous from the left or from the right there, a kink at $x = 6$ and a vertical tangent at $x = 7$.

9: 7 pts

Pg 3 Tot (17)

Name _____

10. a) State the formal definition of the derivative of $f(x)$ at $x = a$.

10a: 4 pts

b) Use the definition to find $f'(x)$ for $f(x) = \frac{1}{\sqrt{x}}$.

10b: 8 pts

11. Find the derivative of $h(t) = (t^2 + t)(t^3 + t^2)(t^4 + 2t)$. Do not simplify.

11: 8 pts

12. Evaluate $\lim_{x \rightarrow -1^+} \frac{x}{x+1}$. It is especially important to show your work on this problem.

12: 8 pts

Pg 4 Tot (28)