Name: $\qquad$
Student \#: $\qquad$

# Okanagan University College Salmon Arm Campus 

# MATH 112 - Calculus I MIDTERM EXAM \#1 

22 October 2004
Instructor: Richard Taylor

Time allowed: 80 minutes

## Instructions:

1. Read all instructions carefully.
2. Read the whole exam before beginning; make sure you have all 8 pages.
3. Organize and write your solutions neatly. If you run out of room, continue your solution on the back of the page.
4. Where appropriate, show your work and explain your solution method-a correct final answer alone is not sufficient to guarantee full credit. Part marks may be awarded even if you don't obtain the final answer.

Problem 1: (a) Find values of $a$ and $b$ that will make $f$ continuous everywhere, if /5

$$
f(x)= \begin{cases}3 x+1 & \text { if } x<2 \\ a x+b & \text { if } 2 \leq x \leq 5 \\ x^{2} & \text { if } x \geq 5\end{cases}
$$

(b) Sketch the graph of $f$, for the values of $a$ and $b$ you found in part (a).

Problem 2: Evaluate the following limits, if they exist (if they do not, explain why):
(a) $\lim _{x \rightarrow 1} \frac{\frac{1}{x}-1}{x-1}$
(b) $\lim _{x \rightarrow 0} \frac{|x|}{x}$.

Problem 3: (a) State the definition of the derivative, $f^{\prime}(x)$.
(b) Apply your definition from part (a) to find the derivative of

$$
f(x)=\sqrt{3 x}
$$

Problem 4: Differentiate each of the following:
(a) $f(x)=(2-5 x)^{5}$
(b) $g(x)=\sqrt{\frac{2 x^{2}-1}{3 x^{2}+2}}$
(c) $h(x)=x^{2}(2 x+\pi)^{2}$
(d) $F(u)=\frac{1}{\sqrt{u}}(u+9)$

Problem 5: A particle moving along the $x$-axis has position

$$
x(t)=2 t^{3}+3 t^{2}-36 t+40
$$

after an elapsed time of $t$ seconds.
(a) At what time(s) is the velocity of the particle equal to zero?.
(b) At what time(s) is the acceleration of the particle equal to zero?.
(c) What is the total distance traveled by the particle during the first 3 seconds?

Problem 6: A rectangle is to be inscribed in a circle of radius $r$. Show that of all possible such rectangles, the one with maximum area is a square.

Problem 7: Find the point on the parabola $y=\sqrt{x}$ that is closest to the point $(2,3)$. /5

