MATH 141: TEST 2

Name ________________________________

Instructions and Point Values: Put your name in the space provided above. Check that you have 6 (different) test pages. Work each problem below and show ALL of your work. You do not need to simplify your answers. Do NOT use a calculator.

Problem (1) is worth 14 points.
Problem (2) is worth 9 points.
Problem (3) is worth 12 points.
Problem (4) is worth 18 points.
Problem (5) is worth 29 points.
Problem (6) is worth 18 points.

---

(1) (a) Calculate $\lim_{x\to\infty} \dfrac{2x+1}{x+3}$. (SHOW WORK!!)

(b) Calculate $\lim_{x\to\infty} \sqrt{x^4+3x^2-2x} - x^2$.

(2) Calculate dy for $y = \sin(x^2 + 1)$.

(3) Calculate $\int (3x + 2)^6 \, dx$.

(4) (a) Use that $f(x+h) \approx f(x) + hf'(x)$ to explain why $\sin(0.001) \approx 0.001$. Fill in the boxes below (but this is not sufficient for an explanation).

$f(x) = \boxed{}$

$x = \boxed{}$

$h = \boxed{}$

(b) Using the Mean Value Theorem, explain why $\sin(0.001) \leq 0.001$.

(5) For this page and the next page, $f(x) = 3x^4 + 8x^3 + 6x^2$.

(a) What are the critical points of $f(x)$?

(b) Where is $f(x)$ increasing?

(c) Where is $f(x)$ decreasing?

(d) What are the local maximum values of $f(x)$?

(e) What are the local minimum values of $f(x)$?

(f) Where is $f(x)$ concave up?

(g) Where is $f(x)$ concave down?

(h) What are the x-coordinates for the inflection points of $f(x)$?

(i) Graph $f(x)$ below.

(6) The points $(1, 2)$ and $(4, 4)$ are on the graph of $y = 2\sqrt{x}$. Find the minimum distance from $(7, 0)$ to that portion of the graph of $y = 2\sqrt{x}$ from the point $(1, 2)$ to the point $(4, 4)$.