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 <u>ALL</u> of your work. You do not need to simplify your answers. Do <u>NOT</u> 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.

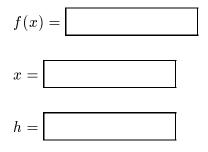
(1) (a) Calculate $\lim_{x \to \infty} \frac{2x+1}{x+3}$. (SHOW WORK!!)

(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).



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

- (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).