Math 155 – Review Worksheet for Exam 3

1: Use linear approximation
(i) to estimate $\sqrt{102}$, $80^\frac{3}{4}$ and $\sin 47^\circ$, respectively;
(ii) to estimate the change of the circumference of a circle, when its radius is increased from 10 in to 10.5 in.

2 Classify the critical points of these functions in their domains or in the indicated intervals:
(i) $f(x) = 10 + 60x + 9x^2 - 2x^3$.
(ii) $f(x) = x + \frac{16}{x}$.
(iii) $f(x) = 3 - x^\frac{3}{2}$.
(iv) $f(x) = \sin x - x \cos x$ in $(-5, 5)$.

3 Compute the first three derivatives of $f(x) = 2x^3 + \frac{1}{x^2} + 56x^\frac{5}{2}$.

4 For the functions below do the following:
(i) Determine the critical points.
(ii) Determine the open intervals where the function is increasing and where it is decreasing.
(iii) Classify the critical point(s).
(iv) Indicate if the graph of $f(x)$ has global extrema.
(v) Identify inflection points if there are any.
(vi) Study the behavior of the graph at infinity and sketch the graph of $y = f(x)$, reflecting all the facts found above.
(vii) Determine the intervals on where the graph is concave upward and those on which the graph is concave downward.

(4A) $f(x) = 2x^3 + 3x^2 - 12x + 5$.

(4B) $f(x) = x^{\frac{3}{2}}(4 - x)$.

(4C) $f(x) = 2 - (x - 3)^{\frac{5}{2}}$.

(4D) $f(x) = \frac{x}{4 - x^2}$.

5 Determine two real numbers with difference 20 and minimum possible product. (You must clearly explain why the answer you obtain yields the minimum product).