

NO CALCULATORS! Be sure to show all necessary work.

1. (30 points) Find these derivatives (DO NOT SIMPLIFY YOUR ANSWERS).

(a) $f(x) = (x^4 - 3x^2 + 2x + 1)^8$

(b) $f(x) = (x^2 + 1)^3(x^2 - 1)^2$

(c) (p163 #33) $f(x) = \frac{x^2 - 1}{x^2 + 1}$

(d) (p163 #37) $f(x) = \frac{4x + 3}{\sqrt{x}}$

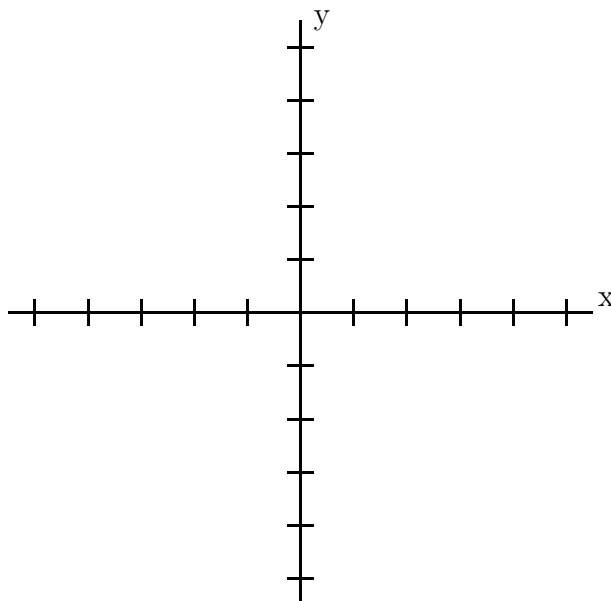
(e) (p172 #35) $f(x) = \sqrt{\frac{x^2 + 1}{x^2 - 1}}$

2. (15 pts; p200 #23) The graph of $f(x) = \frac{-8}{x^2 + 1}$ has one relative extreme point. Find the coordinates of this point, and use the sign of $f'(x)$ to determine whether the point is a relative maximum or a relative minimum. *You do not need to include a sketch of the graph.*

3. (10 pts; p155 #3) Given the cost function $C(x) = 0.001x^2 + 1.2x + 60$ and revenue function $R(x) = 5x$, find each of the following:

- the profit function $P(x)$;
- $R(100)$; $C(100)$; $P(100)$
- the marginal profit when $x = 100$.

4. (20 pts) Sketch the graph of the function $f(x) = x^3 - 3x^2 - 1$. First find:
- (a) $f'(x)$ and $f''(x)$ (factor your answer);
 - (b) critical points (if any); where $f(x)$ is increasing; where $f(x)$ is decreasing;
 - (c) inflection points (if any); where $f(x)$ is concave up; where $f(x)$ is concave down;
 - (d) the extreme points (relative maximum or relative minimum) of the curve (if any).



5. (10 pts) Find an equation for the line tangent to the graph of $y = x(x - 1)^5$ at the point $(2, 2)$.

6. (15 pts; p232 #41) For the function $f(x) = \frac{2x^2}{x^2 - 16}$, find
(a) $f'(x) =$

(b) critical points (if any); where the graph is increasing; where the graph is decreasing;

(c) the vertical and horizontal asymptotes.

(d) Given $f''(x) = \frac{192x^2 + 1024}{(x^2 - 16)^3}$, find where the graph is concave up; concave down.

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TOTAL	/ 100
GRADE	