

# Math 211

## Sample Test 3

1. Find  $\frac{dy}{dx}$

(a)  $y = \arcsin(3x^2 + x)$

(b)  $y = x \operatorname{arccot} x$

(c)  $y = \cosh\left(\frac{1}{x}\right)$

(d)  $y = \operatorname{sech}(\sec x)$

2. Use the first derivative test to find the local extrema of  $f(x) = -x^3 + 3x^2 - 2$ . Determine the intervals where the function is increasing and the intervals where it is decreasing.

3. Use the second derivative test to find the local extrema of  $f(x) = 8x^3 - 2x^4$ . Determine the intervals where the function is concave up and intervals where it is concave down. Find the points of inflection.

4. Find all the vertical, horizontal, and/or slant asymptotes of  $y = \frac{x^3 + 2x^2}{x^2 - 1}$ .

5. Make use of domain, asymptotes, intercepts, relative extrema and points of inflection to obtain an accurate graph of

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

6. Evaluate and simplify

(a)  $\lim_{x \rightarrow 0^-} \frac{e^x - x - 1}{\sin x - x}$

(b)  $\lim_{x \rightarrow 0^+} (\cos x)^{1/x^2}$

(c)  $\lim_{x \rightarrow \infty} \frac{\ln(x^2)}{x^3}$

(d)  $\lim_{x \rightarrow 0^+} (1 + x)^{1/x}$