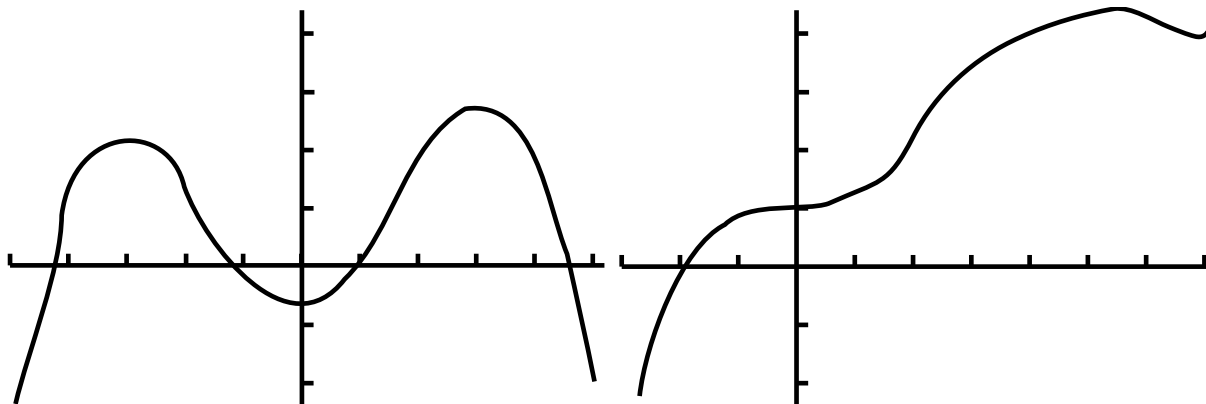
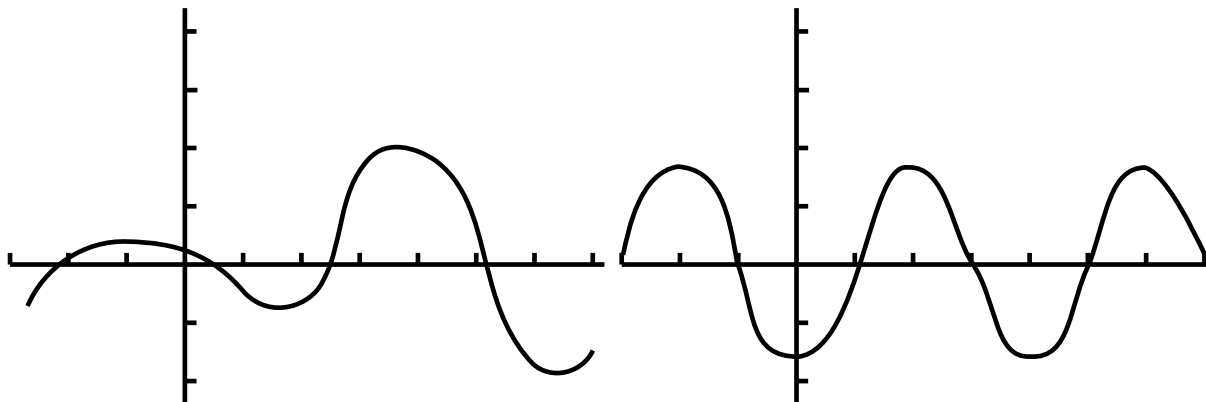


Math 220 AD9 Spring 2009 Worksheet 10

1. If the graphs below are of $f(x)$, sketch the graph of $f'(x)$.



2. If the graphs above are of $f'(x)$, sketch a plausible graph of $f(x)$.



3. Using graphs, limits, or sinister voodoo rituals, determine whether the tangent line to $y = f(x)$ exists at $x = a$. If not, why not? If so, find its slope.

(a) $f(x) = \begin{cases} x^2 + x & \text{if } x < 1 \\ 3x - 1 & \text{if } x \geq 1 \end{cases}$ at $a = 1$

(b) $f(x) = |x + 2|$ at $a = -2$.

(c) $\begin{cases} x^2 - 1 & \text{if } x \leq 3 \\ 14 - 2x & \text{if } x > 3 \end{cases}$

4. Find the derivatives of the following functions:

(a) $f(x) = \sqrt{3x + 1}$

(b) $f(x) = \frac{2}{4x-1}$

(c) $f(x) = 2x^2 - 5x + 1$

(d) $f(x) = 7x - 1$

5. Find the tangent line to $y = 2x^2 + 1$ at $x = 3$.
6. Are these pairs of lines perpendicular, parallel or neither?
 $2x - y = 4$, $4y + 2x = 3$
 $3x + 2y = 1$, $4y = 6x + 5$
7. Find the line between the points $(1, 2)$ and $(3, 7)$.
8. What is the domain of $\ln(3x + 1)$? $\sqrt{x^2 - 9}$? $\frac{x^2+x}{x^3-x}$?
9. If $f(x) = \sqrt{x - 4}$ and $g(x) = 2x^2$, what is $g \circ f$? What is its domain?
10. Is this function one-to-one? If so, what is its inverse?
 e^{x^2} , $\ln 5x + 2$, $x^4 - 1$, $x^3 - 2$
11. What is $\sin(\operatorname{arcsec} 2)$? $\sec(\arcsin 3/5)$?
12. What are the solutions to $4 \cos^2 x - 1 = 0$?
13. $\lim_{x \rightarrow -1} \frac{x^2 + 3x + 2}{x^2 + x}$, $\lim_{x \rightarrow 0} \frac{\sin^2 3x}{x^2}$, $\lim_{x \rightarrow -\infty} e^{x^2+x}$, $\lim_{x \rightarrow \infty} \frac{2x^3 - 3x^2 + 4x - 5}{3x^N + 5x^2 - 1}$ (if $N = 2, 3, 4$)
14. Find the intercepts, horizontal asymptotes, vertical asymptotes of $\frac{x^3 + x^2 - 2x}{2x^3 - 8x}$. How does this function behave near its vertical asymptotes?
15. Use the squeeze theorem to prove that $\lim_{x \rightarrow 0} \frac{2x^3}{x^2 + 1} = 0$.
16. Use the Intermediate Value Theorem to verify that $f(x) = x^3 - x - 1$ has a zero in the interval $[1, 2]$. How could use estimate this zero?
17. Find a and b that make this function continuous:

$$f(x) = \begin{cases} a + \sin x & \text{if } x < 0 \\ x^2 & \text{if } 0 \leq x \leq 2 \\ bx - 3 & \text{if } x > 2. \end{cases}$$

Preparation for next time

Good luck in the exam!