CALCULUS
WORKSHEET ON DERIVATIVES #2

Work the following on **notebook paper**.

1. Use the graph of $y = f(x)$ in the figure below to estimate the value of $f'(1)$, $f'(3)$, $f'(5)$, and $f'(6)$.

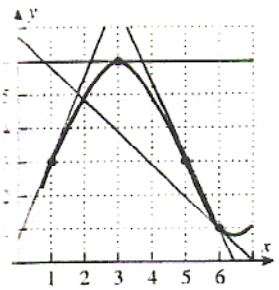


Figure for problem 1

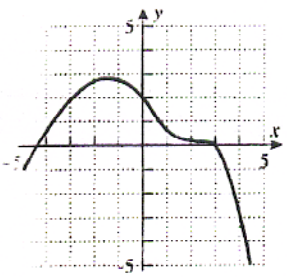
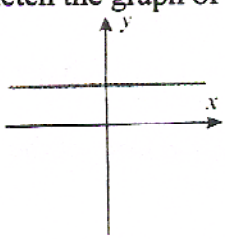


Figure for problem 2

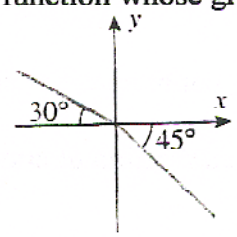
2. For the function graphed above, arrange the numbers 0, $f'(-3)$, $f'(0)$, $f'(2)$, and $f'(4)$ in increasing order.
3. Given that the tangent line to $y = f(x)$ at the point $(1, 2)$ passes through the point $(-1, -1)$, find $f'(1)$.
4. Sketch the graph of a function f for which $f(0) = -1$, $f'(x) < 0$ if $x < 0$, and $f'(x) > 0$ if $x > 0$.
5. Given that $f(3) = -1$ and $f'(3) = 5$, find an equation for the tangent line to the graph of $y = f(x)$ at $x = 3$.

Sketch the graph of the derivative of the function whose graph is shown.

6.



7.



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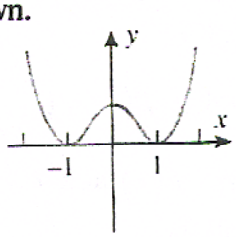

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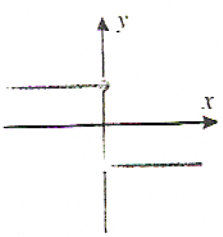
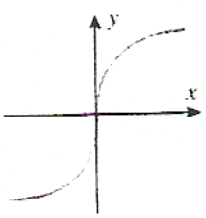
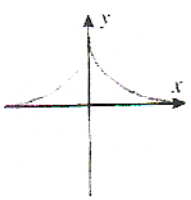


10.



11.



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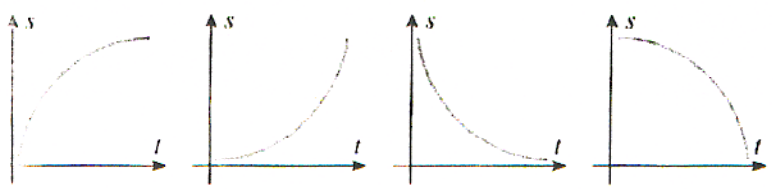
10. The figure below shows the position versus time curves of four different particles moving on a straight line. For each particle, determine whether its instantaneous velocity is increasing or decreasing with time.



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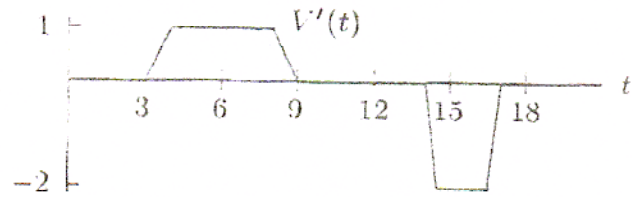
11. A child inflates a balloon, admires it for awhile, and then lets the air out at a constant rate. If $V(t)$ gives the volume of the balloon at time t, then the figure below shows $V'(t)$ as a function of t. At what time does the child:

(a) Begin to inflate the balloon?

(b) Finish inflating the balloon?

(c) Begin to let the air out?



Each of the given limits represents $f'(c)$ for some function f and some number c. Find $f(x)$ and c for each problem.

12. $\lim\limits_{\Delta x \to 0} \dfrac{\sqrt{1+\Delta x}-1}{\Delta x}$

13. $\lim\limits_{x \to 4} \dfrac{x^{3/2}-8}{x-4}$

14. $\lim\limits_{h \to 0} \dfrac{\cos(\pi+h)+1}{h}$

15. $\lim\limits_{h \to 0} \dfrac{e^{3+h}-e^3}{h}$

16. $\lim\limits_{x \to \frac{\pi}{3}} \dfrac{\tan x-\sqrt{3}}{x-\frac{\pi}{3}}$

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17. Show that $f(x)=\begin{cases} x^2+1, & x \le 1 \\ 2x, & x>1 \end{cases}$ is continuous and differentiable at $x=1$. Sketch the graph of both $f(x)$ and $f'(x)$. Use the definition of continuity and the alternative form of the derivative.

18. Show that $f(x)=\begin{cases} x^2+2, & x \le 1 \\ x+2, & x>1 \end{cases}$ is continuous but not differentiable at $x=1$. Sketch the graph of both $f(x)$ and $f'(x)$. Use the definition of continuity and the alternative form of the derivative.