

NAME:

SECTION:

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**Instructions:**

1. Read every problem CAREFULLY!
2. You are allowed a 8.5x11 inch sheet of handwritten notes, front and back. No other notes or books are allowed.
3. You may use a TI-30x IIS Calculator. No other calculators are allowed.
4. All answers should be EXACT. Decimal approximations will not be given full credit.
5. You **must** show your work! If it is not clear how you got from point A to point B, you will lose points.
6. You **must** write your name and section on EVERY page.

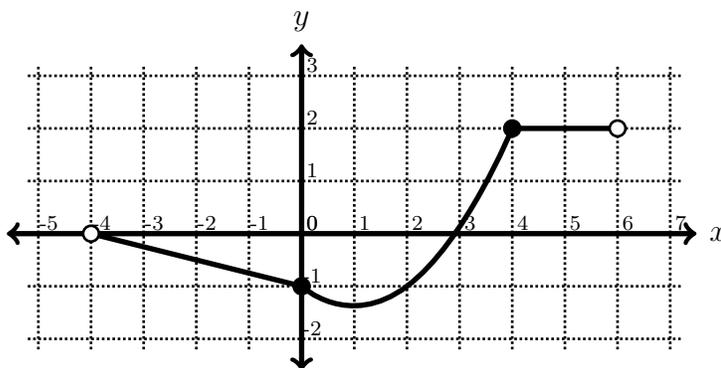
Good Luck!

1a	/10
1b	/10
1c	/10
1d	/10
2a	/10
2b	/10
3a	/10
3b	/10
3c	/10
4a	/10
4b	/10
5a	/10
5b	/10
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1. Consider the graph of  $y = f(x)$ .



(a) What is  $f'(-2)$ ? Why?

(b) What are the values of  $a$  where  $f'(a) = 0$ ? Why?

(c) Sketch a graph of  $y = f'(x)$ .

(d) Let  $g(x)$  be a function so that  $g'(x) = f(x)$ . In other words, the graph above is also the graph of  $y = g'(x)$ . (**Note the derivative!**) Is  $g(1)$  larger, smaller, or equal to  $g(2)$ ? Why?

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2. Let  $f(x) = x^2 - 7x + 3$ .

(a) Find the equation of the tangent line to  $y = f(x)$  at  $P = (1, -3)$ .

(b) Find a point  $P$  so that the tangent line to  $y = f(x)$  at  $P$  has  $y$ -intercept  $-1$ .

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3. Determine whether the following limits exist, go to  $\pm\infty$ , or do not exist. If the limit exists, compute it.

(a)  $\lim_{x \rightarrow \infty} (\sqrt{x^2 - 2x} - x + 3)$

(b)  $\lim_{x \rightarrow 0^-} \frac{\sin x}{x^2}$

(c)  $\lim_{x \rightarrow 1} (\tan^{-1}(x)\sqrt{4x^2 + 5})$

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4. Determine if the derivative of  $f(x)$  at  $x = a$  exists and if so, compute  $f'(a)$ . You may assume that the function  $f(x)$  is continuous at  $x = a$ .

(a)  $a = \pi/2, f(x) = e^x\sqrt{x} + \sin x$

(b)  $a = 1, f(x) = \begin{cases} x^2 - 3x + 3 & \text{if } x \leq 1 \\ x^{-1} & \text{if } x > 1 \end{cases}$

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5. A particle is travelling along the  $x$ -axis. Its position at time  $t$  is given by  $e^t(t^2 + 2t - 2)$ .

(a) Find all time values  $t$  such that the instantaneous velocity at  $t$  is zero.

(b) Determine all times where the particle is moving to the left.