Exam #2 prep problems

1. Find the stationary points of the function $f(x) = x^3 - 3x^2 + 1$.

   a. Determine whether the stationary points are local maxima, local minima or terrace points by checking the sign of f' on either side of the points.

   b. Find the absolute maximum and minimum values on the interval [-2,4].

2. Use the table below to answer parts (b) and (c) of this question.

x	1	2	3	4
$f(x)$	4	0	2	-1
$f'(x)$	$\frac{1}{2}$	3	-2	1

(a) Find an expression for $g'(x)$ when $g(x) = x^2 f(x)$.

(b) Is g increasing or decreasing when $x = 3$? Why?

3. State True or false regarding each of the statements below and justify your response. Suppose $F(x)$ is an antiderivative of a differentiable function $f(x)$. Also, $f(3)=4$ and $f'(3)=-1$.

a. ______ $\lim_{h\to 0}\frac{F(3+h)-F(3)}{h}=4.$

<u>Justification</u>

b. ______ $F(x)$ is increasing at $x=3$.

<u>Justification:</u>

c. ______ The graph of $F(x)$ is concave up at $x=3$.

<u>Justification:</u>

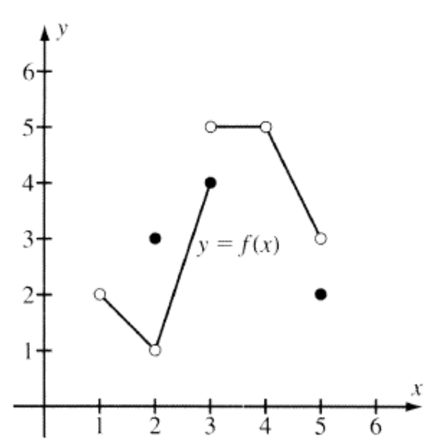
4. Find the antiderivative of $f(x)=2\sin x-\cos 2x$ so that $F(\pi)=1$.

5. Use the accompanying graph of $f(x)$ to evaluate the following limits. If the limit exists state the value, otherwise write DNE.

$\lim_{x\to 2} =$

$\lim_{x\to 3^+} =$

$\lim_{x\to 3} =$



6. If True, explain why. If false, justify your response with words and/or a graph. Place explanations in the spaces below.

a) If $\lim_{x \to a} f(x)$ exists, then $f(x)$ is continuous at *x=a.*

b) If $\lim_{x \to a} f(x)$ exists, then $f(a)$ is defined.

c) If $f(x)$ is continuous at the point x = a, then $\lim_{x \to a} f(x)$ exists.

d) If $f(x)$ is continuous at x = a, then $f'(a)$ exists.

7. Evaluate the following. If the limit does not exist write DNE.

$$\lim_{x \to 0} \frac{e^x - e^{2x}}{1 - e^x}$$

$$\lim_{x \to 9} \frac{\sqrt{x} - 3}{x - 9}$$

$$\lim_{x \to 3} \frac{x^2 - 3x + 2}{x - 3}$$