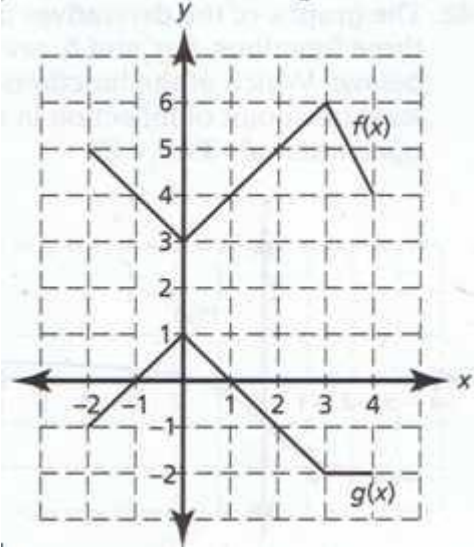


Problem Set #2 – Derivatives

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Name: _____

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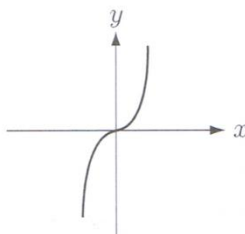
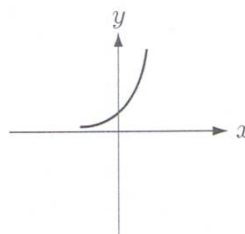
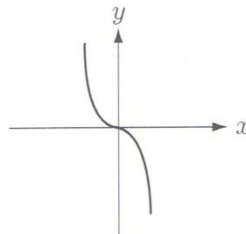
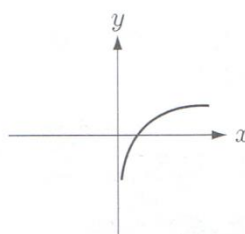
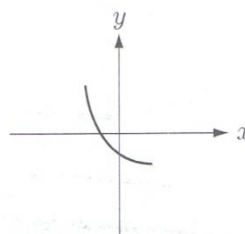
1.	<p>What is the value of $k + c$ if $f(x) = \begin{cases} 2kx^2 - x, & x > 3 \\ x^3 + cx, & x \leq 3 \end{cases}$ is everywhere differentiable?</p> <p>a. $5/4$ b. 3 c. 8 d. 11 e. 24</p>
2.	<p>The graphs of $f(x)$ and $g(x)$ are shown below. If $h(x) = \frac{g(2x)}{f(x)}$, use the graphs to find $h'(1)$.</p>  <p>a) $-7/4$ b) $-9/16$ c) $-7/16$ d) $-5/16$ e) $-3/16$</p>
3.	<p>Let f and g be differentiable functions with the following properties:</p> <p>(i) $g(x) > 0$ for all x (ii) $f(0) = 1$</p> <p>If $h(x) = f(x)g(x)$ and $h'(x) = f(x)g'(x)$, then $f(x) =$</p> <p>(A) $f'(x)$ (B) $g(x)$ (C) e^x (D) 0 (E) 1</p>

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<p>4.</p>	<p>If, for all real numbers x, $f'(x) < 0$ and $f''(x) > 0$, which of the following curves could be part of the graph f?</p> <p>(A) </p> <p>(B) </p> <p>(C) </p> <p>(D) </p> <p>(E) </p>
<p>5.</p>	<p>What is $\lim_{h \rightarrow 0} \frac{8\left(\frac{1}{2} + h\right)^8 - 8\left(\frac{1}{2}\right)^8}{h}$?</p> <p>(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) The limit does not exist.</p> <p>(E) It cannot be determined from the information given.</p>
<p>6.</p>	<p>The slope of the line tangent to the graph of $y = \ln(x^2)$ at $x = e^2$ is</p> <p>(A) $\frac{1}{e^2}$ (B) $\frac{2}{e^2}$ (C) $\frac{4}{e^2}$ (D) $\frac{1}{e^4}$ (E) $\frac{4}{e^4}$</p>
<p>7.</p>	<p>If $f(x) = \frac{x-1}{x+1}$ for all $x \neq -1$, then $f'(1) =$</p> <p>(A) -1 (B) $-\frac{1}{2}$ (C) 0 (D) $\frac{1}{2}$ (E) 1</p>

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8.	<p>If $y = \cos^2 3x$, then $\frac{dy}{dx} =$</p> <p>(A) $-6 \sin 3x \cos 3x$ (B) $-2 \cos 3x$ (C) $2 \cos 3x$ (D) $6 \cos 3x$ (E) $2 \sin 3x \cos 3x$</p>
9.	<p>The position of a particle moving along a straight line at any time t is given by $s(t) = t^2 + 4t + 4$. What is the acceleration of the particle when $t = 4$?</p> <p>(A) 0 (B) 2 (C) 4 (D) 8 (E) 12</p>
10.	<p>If f and g are twice differentiable and if $h(x) = f(g(x))$, then $h''(x) =$</p> <p>(A) $f''(g(x))[g'(x)]^2 + f'(g(x))g''(x)$ (B) $f''(g(x))g'(x) + f'(g(x))g''(x)$ (C) $f''(g(x))[g'(x)]^2$ (D) $f''(g(x))g''(x)$ (E) $f''(g(x))$</p>
11.	<p>Let f be a function that is differentiable on the open interval $(1,10)$. If $f(2) = -5$, $f(5) = 5$, and $f(9) = -5$, which of the following must be true?</p> <p>I. f has at least 2 zeros. II. The graph of f has at least one horizontal tangent. III. For some c, $2 < c < 5$, $f(c) = 3$.</p> <p>(A) None (B) I only (C) I and II only (D) I and III only (E) I, II, and III</p>

12.	<p>An equation of the line tangent to the graph of $y = \cos(2x)$ at $x = \frac{\pi}{4}$ is</p> <p>(A) $y - 1 = -\left(x - \frac{\pi}{4}\right)$</p> <p>(B) $y - 1 = -2\left(x - \frac{\pi}{4}\right)$</p> <p>(C) $y = 2\left(x - \frac{\pi}{4}\right)$</p> <p>(D) $y = -\left(x - \frac{\pi}{4}\right)$</p> <p>(E) $y = -2\left(x - \frac{\pi}{4}\right)$</p>
13.	<p>At what point on the graph of $y = \frac{1}{2}x^2$ is the tangent line parallel to the line $2x - 4y = 3$?</p> <p>(A) $\left(\frac{1}{2}, -\frac{1}{2}\right)$ (B) $\left(\frac{1}{2}, \frac{1}{8}\right)$ (C) $\left(1, -\frac{1}{4}\right)$ (D) $\left(1, \frac{1}{2}\right)$ (E) $(2, 2)$</p>
14.	<p>If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 - 4}{x + 2}$ when $x \neq -2$, then $f(-2) =$</p> <p>(A) -4 (B) -2 (C) -1 (D) 0 (E) 2</p>

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15.

The slope of the line normal to the graph of $y = 2 \ln(\sec x)$ at $x = \frac{\pi}{4}$ is

(A) -2

(B) $-\frac{1}{2}$

(C) $\frac{1}{2}$

(D) 2

(E) nonexistent

Free Response – No Calculators Please

1. The position function of a particle is given by $x(t) = t^3 - 2t^2 - 4t + 6$ for $t \geq 0$.
 - a) Find the velocity function
 - b) Find the acceleration function
 - c) For what value(s) of t , $0 \leq t \leq 4$, is the particle's instantaneous velocity the same as its average velocity on the closed interval $[0, 4]$? Show all work that leads to your conclusion.
 - d) Find the total distance traveled by the particle from $t = 0$ until $t = 4$. Show all work that leads to your conclusion.

2. Let $f(x) = \sqrt{1 - \sin x}$.
 - a) What is the domain of f ?
 - b) Find $f'(x)$
 - c) What is the domain of f' ?
 - d) Write an equation for the line tangent to the graph of f at $x = 0$

Problem Set #2 – Derivatives

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Answer Sheet: Multiple Choice (3 points each)

1.	2.	3.	4.	5.
6.	7.	8.	9.	10.
11.	12.	13.	14.	15.

Free Response Question #1

a) (1 point)
b) (1 point)
c) (3 points)
d) (4 points)

Problem Set #2 – Derivatives

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Free Response Question #2

a) (1 point)

b) (2 points)

c) (3 points)

d) (3 points)

Problem Set #2 – Derivatives

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1.D	2.C	3.E	4.E	5.B
6.B	7.D	8.A	9.B	10. A
11. E	12. E	13. B	14. A	15. B

Free Response Question #1

e) (1 point)

$$v(t) = 3t^2 - 4t - 4$$

f) (1 point)

$$a(t) = 6t - 4$$

g) (3 points)

1 pt for finding AROC

$$\frac{22 - 6}{4} = 4$$

1 pt for setting them equal:

$$3t^2 - 4t - 4 = 4$$

1 pt for solving for t and final analysis:

$$t = \frac{4 + \sqrt{112}}{6}$$

.

h) (4 points)

1 pt for finding the zeros of the velocity:

$$3t^2 - 4t - 4 = 0$$

$$(3t + 2)(t - 2) =$$

$$0 \quad t = -2/3 \text{ or } t = 2$$

2 point for analyzing the data with a chart

$$s(0) = 6, \quad s(2)$$

$$= -2 \text{ and } s(4) = 22$$

1 point for answer

total distanced

traveled is 32 units

Name: _____

Date: _____

Free Response Question #2

a) (1 point)

All real #'s

b) (2 points)

$$y' = \frac{\cos x}{2\sqrt{1 + \sin x}}$$

c) (2 points)

1 point setting numerator = 0

$$\cos x = 0$$

 $x = \pi/2$ 1 point for answer

d) (2 points)

1 point for setting the denominator = 0

1 point for the answer

$$x = 3\pi/2$$

(2 points)

$$1 \text{ pt. } f(0) = 1$$

$$1 \text{ pt. } f'(0) = -1/2$$

$$1 \text{ pt. } y - 1 = \frac{1}{2}(x)$$