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8. Let $f(x) = x^4 - 18x^2$. Find the interval where $f(x)$ is concave down and decreasing.

A) $\left(0, \sqrt{3}\right)$ B) $(0, 3)$ C) $(-3, 0)$ D) $\left(-\sqrt{3}, 0\right)$

E) $(3, \infty)$ F) $(-\infty, 0)$ G) $(0, 2)$ H) $(-2, 0)$

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3. Find the local minimum value of

$$f(x) = x^3 - 5x^2 - 8x + 50$$

A) -1 B) 0 C) 1 D) $\frac{5}{3}$

E) 2 F) $\frac{7}{3}$ G) 3 H) 4

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7. Let

$$f(x) = x + \frac{1}{x}$$

Find the number c satisfying the conclusion of the Mean Value Theorem on the interval $[1, 3]$.

A) 1

B) $\frac{5}{4}$

C) $\frac{3}{2}$

D) $\frac{8}{5}$

E) $\sqrt{3}$

F) 2

G) $\frac{5}{2}$

H) 3

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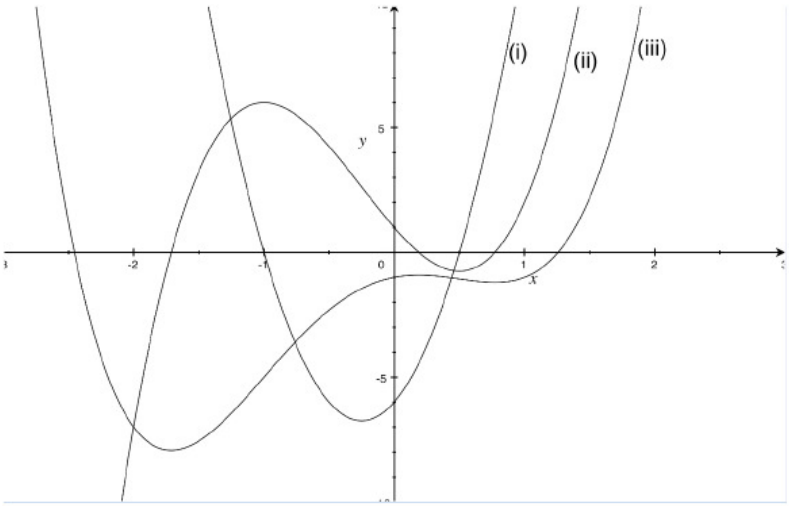
6. The curves (i), (ii), and (iii) in the graph below are the graphs of a function f and its first and second derivatives. Which curve is f, which is f', and which is f''? Explain.



A) $(i)\ f \quad (ii)\ f' \quad (iii)\ f''$

B) $(i)\ f \quad (ii)\ f'' \quad (iii)\ f'$

C) $(i)\ f' \quad (ii)\ f \quad (iii)\ f''$

D) $(i)\ f' \quad (ii)\ f'' \quad (iii)\ f$

E) $(i)\ f'' \quad (ii)\ f \quad (iii)\ f'$

F) $(i)\ f'' \quad (ii)\ f' \quad (iii)\ f$

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9. Find the difference between the local maximum and the local minimum values of the function $f(x) = x^3 - 3x + 27$.

a. 4
b. 1
c. 9
d. 2
e. 6
f. 5
g. 8
h. 3

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10. Find the absolute minimum value for the function $f(x) = 2\sin x \cos x$ for $0 \le x \le \pi$.

a. 1

b. -2

c. $\frac{1}{4}$

d. 0

e. -1

f. 2

g. $\frac{1}{2}$

h. No absolute minimum

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11. Find the interval on which $f(x) = xe^{-x}$ is increasing.

a. $(-\infty, 1)$

b. $(-\infty, 2)$

c. $(1, \infty)$

d. $(1, 2)$

e. $(1, e)$

f. $(-\infty, e)$

g. $(-\infty, \infty)$

h. $\left(-\infty, \frac{1}{e}\right)$

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12. Find the x-coordinate of the point of inflection of the function $f(x) = x^3 - x^2 - x + 1$.

a. $-\frac{3}{4}$

b. $-\frac{3}{2}$

c. $\frac{3}{4}$

d. $-\frac{1}{3}$

e. $\frac{3}{2}$

f. $\frac{1}{3}$

g. $-\frac{3}{4}$

h. $\frac{2}{3}$

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Answers:

Fall 2011 # 8 : A

Spring 2011 # 3 : E

Spring 2011 # 7 : E

Fall 2010 # 6 : F

Spring 2010 # 9 : A

Spring 2010 # 10 : E

Spring 2010 # 11 : A

Spring 2010 # 12 : F