

Calculus Review for Sinclair Exam 1

**** Quiz 4 Material ****

Problem Type 8: Derivative Graphs

EXAMPLE 1 The graph of a function f is given in Figure 1. Use it to sketch the graph of the derivative f' .

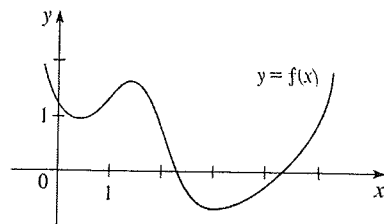
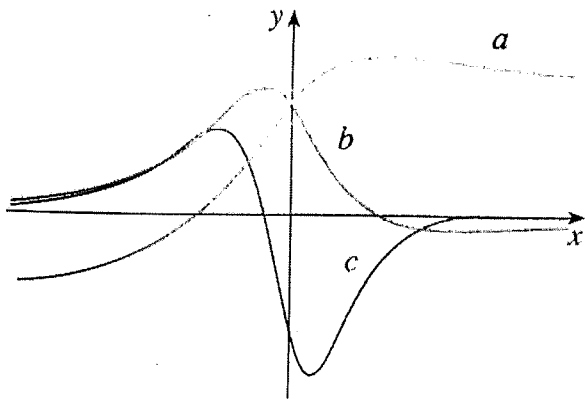


FIGURE 1

47. The figure shows the graphs of f , f' , and f'' . Identify each curve, and explain your choices.



Problem Type 9: Derivatives as Functions

EXAMPLE 2

- (a) If $f(x) = x^3 - x$, find a formula for $f'(x)$.
(b) Illustrate this formula by comparing the graphs of f and f' .

EXAMPLE 3 If $f(x) = \sqrt{x}$, find the derivative of f . State the domain of f' .

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Key

** Quiz 4 Material **

Problem Type 8: Derivative Graphs

EXAMPLE 1 The graph of a function f is given in Figure 1. Use it to sketch the graph of the derivative f' .

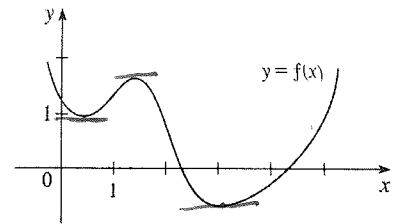
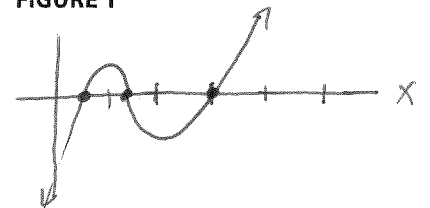
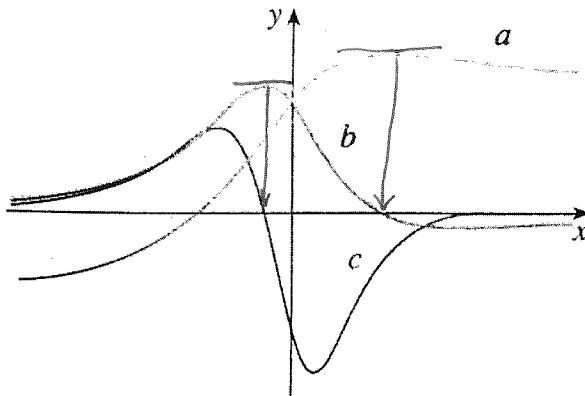


FIGURE 1



47. The figure shows the graphs of f , f' , and f'' . Identify each curve, and explain your choices.



b is deriv of a
c is deriv of b

f is a
f' is b
f'' is c

Problem Type 9: Derivatives as Functions

EXAMPLE 2

- (a) If $f(x) = x^3 - x$, find a formula for $f'(x)$.
 (b) Illustrate this formula by comparing the graphs of f and f' .

$$f'(x) = 3x^2 - 1$$

EXAMPLE 3 If $f(x) = \sqrt{x}$, find the derivative of f . State the domain of f' .

$$f'(x) = \frac{1}{2\sqrt{x}}$$

work on the back

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$f(x) = x^3 - x$$

$$\frac{(x+h)^3 - (x+h) - (x^3 - x)}{h}$$

$$(x^2 + 2xh + h^2)(x+h) \\ x^3 + 3x^2h + 3xh^2 + h^3$$

$$\frac{x^3 + 3x^2h + 3xh^2 + h^3 - x - h - x^3 + x}{h}$$

$$\lim_{h \rightarrow 0} \frac{h(3x^2 + 3xh + h^2 - 1)}{h} = 3x^2 - 1$$

$$f'(x) = 3x^2 - 1$$

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$f(x) = \sqrt{x}$$

$$\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} \left(\frac{\sqrt{x+h} + \sqrt{x}}{\sqrt{x+h} + \sqrt{x}} \right)$$

$$\frac{x+h + \sqrt{x+h}\sqrt{x} - \sqrt{x}\sqrt{x+h} - x}{h(\sqrt{x+h} + \sqrt{x})}$$

$$\lim_{h \rightarrow 0} \frac{h \cdot 1}{h(\sqrt{x+h} + \sqrt{x})} = \frac{1}{\sqrt{x+0} + \sqrt{x}}$$

$$= \frac{1}{2\sqrt{x}}$$

$$= \frac{\sqrt{x}}{2x}$$