Math 0120 Homework_03 is due : 08/29/2012 at 02:07pm EDT.

Reference: Berresford, Sections 2.1, 2.2, 2.3

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1. (1 pt) If

$$f(t) = \frac{\sqrt{7}}{t^7},$$

find $f'(t)$.

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Find $f'(5)$.

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2. (1 pt) If

$$f(x) = \frac{5x^2+6x+6}{\sqrt{x}},$$

find $f'(x)$.

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Find $f'(1)$.

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3. (1 pt) If $f(x) = \sqrt{13x}$, find $f'(x)$.

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Find $f'(3)$.

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4. (1 pt) The total cost (in dollars) of producing x coffee machines is

$$C(x) = 1600+70x-0.9x^2.$$

(A) Find the exact cost of producing the 21st machine.
Exact cost of 21st machine = ____________
(B) Use marginal cost to approximate the cost of producing the 21st machine.
Approx. cost of 21st machine = ____________

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5. (1 pt) If

$$f(x) = \frac{3x^3-2}{x^4}$$

find $f'(x)$.

____

Find $f'(4)$.

____

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6. (1 pt) Let $f(x) = 9x+28/x^2$. Then the equation of the tangent line to the graph of $f(x)$ at the point $(2,25)$ is given by $y = mx+b$ for

$m =$ ____
and
$b =$ ____.

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7. (1 pt)
Differentiate the following function:

$$f(x) = -9\pi^2$$

$f'(x) =$ ________

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8. (1 pt)
Find the equation of the tangent line to the curve $y = x\sqrt{x}$ at the point $(9,27)$.
$y =$ ____________

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9. (1 pt)
(a) A company makes computer chips from square wafers of silicon. It wants to keep the side length of a wafer very close to 15 mm, and it wants to know how the area $A(x)$ of a wafer changes when the side length x changes.
Find $A'(15)$. [Can you explain its meaning in this situation?]
(b) What is the rate of change of the area of the square with respect to its side length when the perimeter is 20 mm?
(a) $A'(15) =$ ________ sq mm/ mm
(b) $A'(?) =$ ________ sq mm/mm

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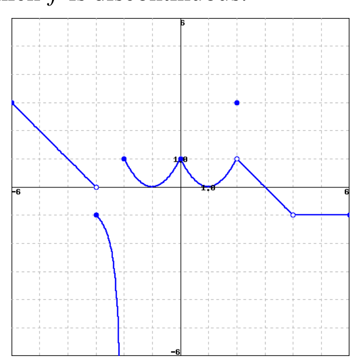
10. (1 pt) Use the given graph of the function to find the x-values for which f is discontinuous.



Answer (separate by commas): $x =$ ________________

Note: *You can click on the graph to enlarge the image.*

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11. (1 pt) Evaluate the limit
$\lim_{y\to 64} \frac{64-y}{8-\sqrt{y}} =$ ____.

12. (1 pt) A projectile is launched straight up from a height of 1152 feet with an initial velocity of 96 ft/sec. Its height at time t is

$$h(t) = -16t^2 + 96t + 1152.$$

Answer the following questions, including **units** in each answer.

At what time does it reach its maximum height? _____
Hint: Its velocity is zero at its maximum height.

How high will it go? _____

What is its velocity at the instant it reaches the ground? _____

13. (1 pt) The population p of a small town, in thousands, is given by

$$p = 8 \cdot 1.07^t$$

where t is time measured in years. Use a calculator or computer to estimate the derivative $p'(7)$.

$p'(7)$ = _____

This means that after 7 years the population is $\boxed{?}$ at a rate of ___ people per year.