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1. (2 pts) For some positive constant C, a patient's temperature change, T, due to a dose, D, of a drug is given by $T = \left(\frac{C}{2} - \frac{D}{3}\right) D^2$.

What dosage maximizes the temperature change?

$D =$ _____

The sensitivity of the body to the drug is defined as dT/dD. What dosage maximizes sensitivity?

$D =$ _____

Answer(s) submitted:

-
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(incorrect)

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2. (2 pts) When an electric current passes through two resistors with resistance r and s, connected in parallel, the combined resistance, R, can be calculated from the equation

$$\frac{1}{R} = \frac{1}{r} + \frac{1}{s},$$

where R, r , and s are positive. Assume that s is constant.

Find $\frac{dR}{dr}$:

$\frac{dR}{dr} =$ _____

Is R and increasing or decreasing function of r? _____

(Enter **increasing**, **decreasing**, **neither**, or **both** (write both if there are values of r for which R is increasing, and other values for which it is decreasing; enter neither if this is a constant function.)

If we consider the interval $a \le r \le b$, where does R take on its global maximum and minimum values?

maximum: $r =$ _____

minimum: $r =$ _____

(Enter **none** if there is no global maximum or minimum for this function.)

Answer(s) submitted:

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(incorrect)

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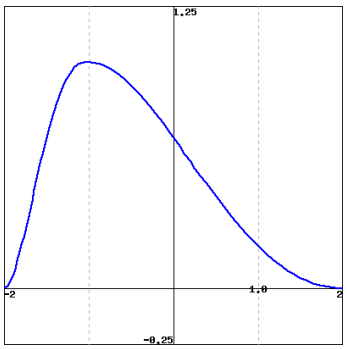
3. (2 pts) The figure below gives the behavior of the derivative of $g(x)$ on $-2 \le x \le 2$.



*Graph of $g'(x)$ (**not** $g(x)$)*
(Click on the graph to get a larger version.)

Sketch a graph of $g(x)$ and use your sketch to answer the following questions.

A. Where does the graph of $g(x)$ have inflection points?

$x =$ _____

Enter your answer as a comma-separated list of values, or enter **none** *if there are none.*

B. Where are the global maxima and minima of g on $[-2,2]$?

minimum at $x =$ ___

maximum at $x =$ ___

C. If $g(-2) = -4$, what are possible values for $g(0)$?

$g(0)$ is in _____

(Enter your answer as an interval, or union of intervals, giving the possible values. Thus if you know $-10 < g(0) \le -5$, enter **(-10,-5]**. *Enter* **infinity** *for ∞, the interval* **[-4,-4]** *to indicate a single point).*

How is the value of $g(2)$ related to the value of $g(0)$?

$g(2)$ ___ $g(0)$

(Enter the appropriate mathematical equality or inequality, $=$, $<$, $>$, etc.)

Answer(s) submitted:

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(incorrect)

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4. (2 pts) Let $p(x) = ax^3 - x$, where a is constant and $a > 0$.

Find the local maxima and minima of p.

(Enter your maxima and minima as comma-separated xvalue,classification pairs. For example, if you found that $x = -2$ was a local minimum and $x = 3$ was a local maximum, you should enter **(-2,min), (3,max)**. *If there were no maximum, you* **must** *drop the parentheses and enter* **-2,min**.*)*

maxima and minima: _____

What effect does increasing the value of a have on the x-position of the maximum(s) you found? (Enter **left**, **none** or **right** if it moves left, has no effect, or moves right.) _____

What effect does increasing the value of a have on the x-position of the minimum(s) you found? (Enter **left**, **none** or **right** if it moves left, has no effect, or moves right.) _____

What effect does increasing the value of a have on the y-coordinate of the maximum(s) you found? (Enter **up**, **none** or **down** if it moves up, has no effect, or moves down.) _____

What effect does increasing the value of a have on the y-coordinate of the minimum(s) you found? (Enter **up**, **none** or **down** if it moves up, has no effect, or moves down.) _____

Answer(s) submitted:

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-

(incorrect)

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5. (2 pts) Consider $f(x) = ax + x\ln(bx)$ for $a > 0$, $b > 1$, and $x > 1$.

Find $f'(x)$: $f'(x) =$ _____

Based on your expression for $f'(x)$, is $f(x)$ increasing or decreasing? (Enter **increasing** or **decreasing**.) _____

(Be sure that you can see why this is true for all values $x > 1$.)

Find $f''(x)$: $f''(x) =$ _____

Based on your expression for $f''(x)$, is $f(x)$ concave up or concave down? (Enter **up** or **down**.) _____

(Be sure that you can see why this is true for all values $x > 1$.)

Answer(s) submitted:

-
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-
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(incorrect)