Test #2 (Part 2 – Calculator Okay)

Name: ________________________________

Math 180, Prof. Beydler

Wednesday, October 24, 2018

Directions: Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, no smart watches, etc.). If you have a phone in your lap or on your chair, it is considered cheating, and you will receive a zero on this test. Write your answers in the indicated places, or box your answers. Good luck!

1. The position of a particle is given by the equation $s(t) = t^3 - 9t^2 + 24t + 1$ (where $t \geq 0$ is measured in seconds and s is measured in meters).

a) (1 point) When is the particle at rest?

Answer: ______________________

b) (1 point) When is the particle moving in the positive direction?

Answer: ________________________

c) (2 points) Find the total distance traveled during the first 6 seconds. Be sure to include units for your answer.

Answer: ____________

d) (1 point) Find the acceleration after 2 seconds. Be sure to include units for your answer.

Answer: ______________

e) (3 points) When is the particle speeding up? When is it slowing down?

Speeding up: _____________________________

Slowing down: ____________________________

2. (1 point) The mass of a thin wire from the left end to a point x inches to the right is e^{2x-1} ounces. Find the linear density when x is 3 inches. Approximate your answer to the nearest 3 decimal places. Be sure to write units for your answer.

Answer: ____________________

3. (4 points) A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away at 2 ft/s, how fast is the top sliding down the wall when the bottom is 4 ft from the wall? Be sure to write units for your answer.

Answer: __________________

4. (3 points) Use a <u>linear approximation</u> (or <u>differentials</u>) to estimate $\sqrt[4]{15.99}$ to 5 decimal places. Be sure to show your work.

$\sqrt[4]{15.99} \approx$ ______________

5. Let $f(x) = 4x^{1/3} - x^{4/3}$.

a) (1 point) Find the domain of f.

Domain: ____________________

b) (1 point) Find the x-intercept(s) and y-intercept of f (if none, write "none").

x-intercept(s): __________ y-intercept: ______

c) (4 points) Find f' and f'', and determine where each are 0 and/or do not exist (DNE). If nowhere, write "nowhere."

$f'(x) = 0$ when $x =$ __________

$f'(x)$ DNE when $x =$ __________

$f''(x) = 0$ when $x =$ __________

$f''(x)$ DNE when $x =$ __________

d) (2 points) Do a sign analysis on f' and f''.

e) (1 point) Find the intervals on which f is increasing and decreasing.

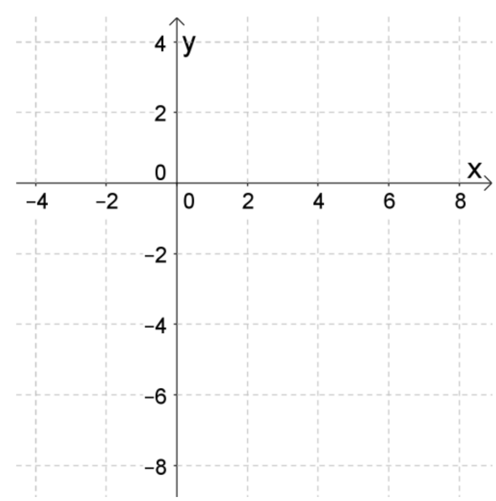
Increasing: ____________________ Decreasing: ____________________

f) (1 point) Find the intervals on which f is concave up and concave down.

Concave up: ____________________ Concave down: ____________________

g) (1 point) Find all local maxima, local minima, and inflection points of f (if any). Be sure to identify which is a max/min/inflection point.

h) (2 points) Sketch the graph of f.



6. (3 points) The radius of a sphere was measured to be 2 inches with a possible error of 0.01 inches. Use differentials to estimate the maximum error in the calculated surface area of the sphere. What is the percentage error? Be sure to write units for your answer.

Estimated maximum error: ____________

Estimated percentage error: ___________

7. (2 points) Use Newton's method to estimate the positive root of $\cos x = x^2$ correct to six decimal places. Start with $x_1 = 1$.

Answer: ______________________

Note: Be sure to double check your work. And remember to turn in your homework and extra credit! ☺

Here are some formulas that I promised to give:

$\frac{d}{dx}(\csc^{-1} x) = \frac{-1}{|x|\sqrt{x^2-1}}$ $\quad$ $\frac{d}{dx}(\sec^{-1} x) = \frac{1}{|x|\sqrt{x^2-1}}$ $\quad$ $\frac{d}{dx}(\cot^{-1} x) = \frac{-1}{1+x^2}$

$\frac{d}{dx}(\operatorname{csch} x) = -\operatorname{csch} x \coth x$ $\quad$ $\frac{d}{dx}(\operatorname{sech} x) = -\operatorname{sech} x \tanh x$ $\quad$ $\frac{d}{dx}(\coth x) = -\operatorname{csch}^2 x$

$\frac{d}{dx}(\sinh^{-1} x) = \frac{1}{\sqrt{1+x^2}}$ $\quad$ $\frac{d}{dx}(\cosh^{-1} x) = \frac{1}{\sqrt{x^2-1}}$ $\quad$ $\frac{d}{dx}(\tanh^{-1} x) = \frac{1}{1-x^2}$

$\frac{d}{dx}(\operatorname{csch}^{-1} x) = -\frac{1}{|x|\sqrt{x^2+1}}$ $\quad$ $\frac{d}{dx}(\operatorname{sech}^{-1} x) = -\frac{1}{x\sqrt{1-x^2}}$ $\quad$ $\frac{d}{dx}(\coth^{-1} x) = \frac{1}{1-x^2}$