Your Name (please PRINT clearly)

Quiz Section

Student ID #

PLEASE READ these instructions:

- This exam is 80 minutes long. Once the exam starts, check that you have a complete exam: there should be 6 problems on 5 pages of questions.
- **All pages are double-sided, except for this cover page and the back of the last page**. You may use the blank sides in this exam for extra room, if needed, but clearly **indicate in the problem area** that more work is on the back of the cover or on the last page.
- This exam is closed book. You may use one two-sided sheet of handwritten notes and a TI-30X IIS calculator. Do not share notes.
- Turn OFF your cell phone and put it away. No headphones or electronic devices are permitted.
- Unless otherwise instructed, remember to **show your work**. If your work is incorrect, incomplete, or unreadable, you may receive little credit, even if the answer itself happens to be correct.
- Simplify your answers but leave them in exact form (e.g. $\pi\sqrt{2}+\frac{e}{2}$). Place a box around $\boxed{\text{your final answer}}$ to each question.
- Please stay within the page borders. Exams will be scanned and the far edges may not be readable.
- Read each problem carefully, before and after answering it. Raise your hand if you have a question. Good luck!

Problem	Points
1	10
2	10
3	9
4	8
5	4
6	9
Total	50

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1. (10 points) Compute the derivatives of the following functions. Do **not** simplify your answers.

   (a) $y = 3^x \cdot (\tan(x))^2$

   (b) $y = \sqrt{x + \sqrt{x^2 + 1}}$

2. Consider the curve implicitly defined by the equation:

$$y^2 - 2e^{xy} = x$$

(a) (6 points) Compute $\frac{dy}{dx}$ in terms of x and y.

(b) (4 points) Find the x-intercept of this curve, and the equation of the tangent line at the x-intercept.

3. (9 points) Compute the derivative $\frac{dy}{dx}$, in terms of x, for the following function (with domain $x > 0$):

$$y = \left(\frac{x}{x+2}\right)^x$$

Show all steps clearly. Simplify and box your final answer.

4. (8 points) A particle is moving along a path (curve) according to the parametric equations, for $t \geq 0$:

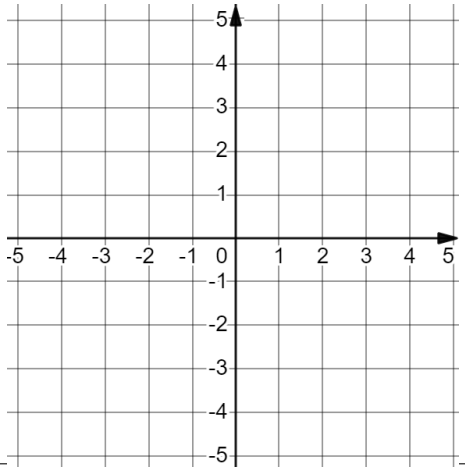
$$\begin{cases} x = 2\sqrt{t} - 1 \\ y = 4t - 2\sqrt{t} - 1 \end{cases}$$

(a) Compute the time(s) t, if any, when the tangent line to this curve is horizontal.

(b) Eliminate the parameter to find the Cartesian equation for the path of this particle (an equation in x and y). Simplify the equation as much as possible.

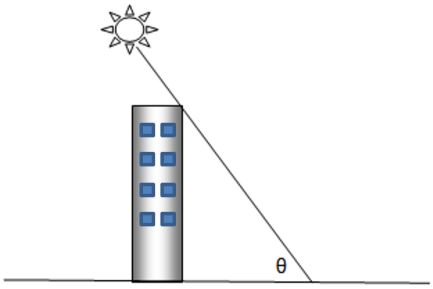
5. (4 points) Sketch the curve corresponding to the following parametric equations, for $0 \leq t \leq 2\pi$. Indicate on your picture the point at $t = 0$ and the direction of motion, as t increases:

$$x = 3\sin(t), \qquad y = 2\cos(t)$$



6. (9 points) At 2 pm, the shadow cast on the ground by an 80-ft tall building is 60 ft long. At that same time, the angle θ that the sun light makes with the ground is decreasing at the rate of 0.16 radians per hour.

   At what rate is the length of the building's shadow changing at that time?
   Show all your work clearly. Box and ***include units*** *in your final answer.*



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