Math 1300
Fall 2025
Quiz 8

Name: Champ

1. (2 points) If an initial population of 150 bacteria triples in size every hour, what is the rate, in bacteria per hour, at which the population is growing after three hours?

   (a) $150 \cdot e^3$
   (b) $150 \cdot 27$
   (c) $150 \cdot \ln(27)$
   (d) $150 \cdot 3\ln(3)$
   (e) $150 \cdot 27\ln(3)$

$P(t) = 150 \cdot 3^t$

$P'(t) = 150 \cdot 3^t \cdot \ln(3)$

$P'(3) = 150 \cdot 3^3 \cdot \ln(3)$

2. (2 points) Find the derivative of $f(x) = \arcsin(8x^3)$.

$y = \arcsin(u)$ $\qquad u = 8x^3$

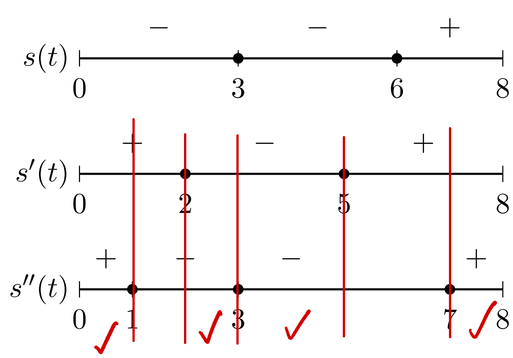
$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$= \frac{1}{\sqrt{1-u^2}} \cdot 24x^2$$

$$= \frac{1}{\sqrt{1-(8x^3)^2}} \cdot 24x^2$$

Answer: $\boxed{\dfrac{24x^2}{\sqrt{1-64x^6}}}$

3. (2 points) In the chart, $s(t)$ is the position function of a particle. The dots are where the respective functions are equal to 0 and the sign of the functions is indicated by "+" and "−" above the number lines. According to the sign chart, list the interval(s) on which the particle is *speeding up*.



Answer: $\boxed{(0,1), (2,5), (7,8)}$

(Also fine: $(0,1), (2,3), (3,5), (7,8)$)

4. (2 points) Find the derivative of $y = \dfrac{(x^2+1)^5\, x^{1/2}}{(x-1)^3\,(3x+2)^{1/4}}$.

$$\ln(y) = \ln\left(\frac{(x^2+1)^5 x^{1/2}}{(x-1)^3(3x+2)^{1/4}}\right)$$

$$\ln(y) = \ln\left((x^2+1)^5\right) + \ln(x^{1/2}) - \ln\left((x-1)^3\right) - \ln\left((3x+2)^{1/4}\right)$$

$$\ln(y) = 5\ln(x^2+1) + \tfrac{1}{2}\ln(x) - 3\ln(x-1) - \tfrac{1}{4}\ln(3x+2)$$

$$\frac{y'}{y} = 5\cdot\frac{1}{x^2+1}\cdot 2x + \frac{1}{2}\cdot\frac{1}{x} - 3\cdot\frac{1}{x-1} - \frac{1}{4}\cdot\frac{1}{3x+2}\cdot 3$$

$$y' = y\left(\frac{10x}{x^2+1} + \frac{1}{2x} - \frac{3}{x-1} - \frac{3}{12x+8}\right)$$

Answer: $\boxed{\dfrac{(x^2+1)^5 x^{1/2}}{(x-1)^3(3x+2)^{1/4}}\left(\dfrac{10x}{x^2+1} + \dfrac{1}{2x} - \dfrac{3}{x-1} - \dfrac{3}{12x+8}\right)}$

5. (2 points) Do you have any questions or comments about the course so far? What has been the most helpful? What would you like to see more of?

MATH 1300 is awesome! I want more math!