Math 132 Test 1

Name: _____

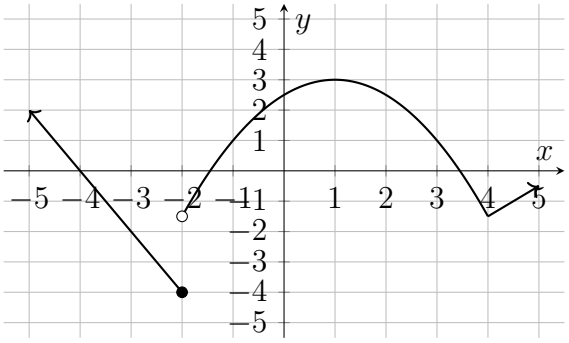
Show all work/rationale. **No notes, internet, calculators, or any other outside resources allowed**.

1. (5 points) The equation of motion of a particle is $s(t) = t^3 - 27t$, where s is measured in meters and t is in seconds. Find the acceleration at $t = 3$.

2. (6 points) Find the derivative of $f(x) = \ln(\sin x)$. Write your final answer as 1 trig function.

3. (6 points) Find the equation of the line tangent to $f(x) = \arctan x$ at $x = 1$.

4. Use the graph of $f(x)$ below to answer the following questions.

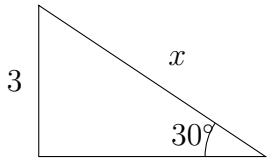


(a). (2 points) At what x-values is $f(x)$ nondifferentiable?

(b). (2 points) Find the average rate of change of $f(x)$ on $[1, 3]$.

(c). (5 points) Which is larger: $f'(-1)$ or $f'(0)$? Explain in one complete sentence.

5. (5 points) Solve for x.



6. (6 points each) Differentiate. You do not need to simplify, but use parentheses where necessary.

(a). $f(x) = \dfrac{3}{\sqrt{x}} + e^{5x}$

(b). $r(\theta) = \cos^5 \theta$

(c). $y = \dfrac{\tan x}{4x^3 - 2}$

7. (6 points) **Use the limit definition of the derivative** to find $f'(x)$ given $f(x) = 5x^2 - 2$.

8. (a). (4 points) Use all logarithm properties applicable to rewrite $\ln\left(\dfrac{xe^x}{4x-1}\right)$.

(b). (6 points) Differentiate your answer to (a) (with respect to x).

9. (8 points) Use logarithmic differentiation to find y' given $y = x^{x^5}$.

10. (8 points) Use implicit differentiation to find $\frac{dy}{dx}$ or y' given $xy^2 = 6y + 5e^x$.

11. (6 points) Find the (x, y) coordinate point(s) where the implicitly defined curve $y^2 = x^2 - 2x + 5$ has a horizontal tangent.

12. Let $T(t)$ be the temperature, measured in degrees Fahrenheit, at t hours after 1pm.

(a). (5 points) Interpret the meaning of $T'(0) = .7$ in the context of this application. Include units.

(b). (3 points) If $T(0) = 50$ and $T'(0) = .7$, estimate the temperature at 3pm.

13. (5 points) The body mass index or BMI (the surface area of skin around a person's body), measured in cm^2, can be modeled by that person's height h in cm and weight w in kg. Would you expect $\frac{d\text{BMI}}{dw}$ to be positive, negative, or 0? Explain in one to 2 complete sentences. Ensure to include units.