Name ____ Test 2, Spring 2018

1) A 13-foot ladder is leaning against a vertical wall (see figure) when Jack begins pulling the foot of the ladder away from the wall at a rate of 0.5ft/s. How fast is the top of the ladder sliding down the wall when the foot of the ladder is 5ft from the wall?

2) Find the derivative of $y = \tan(e^x)$.

3) Find the derivative of $\big((x+2)(x^2+1)\big)^4$

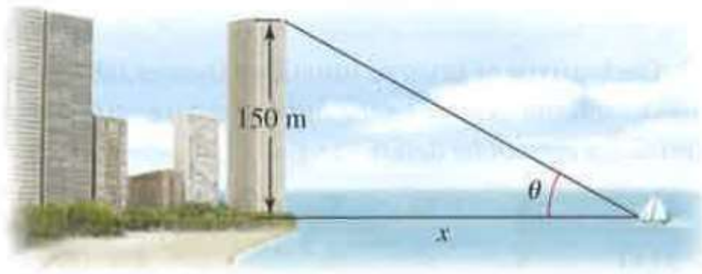
4) Given that $\cos(y^2) + x = e^y$, find $\frac{dy}{dx}$.

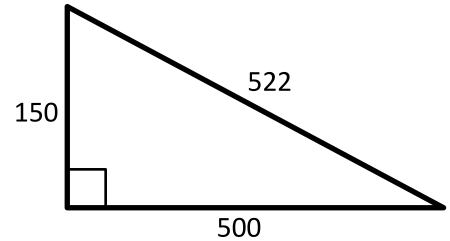
5) Given that $y = x^{\frac{5}{4}}$, find $\frac{dy}{dx}$.

6) Given that $g(y) = e^y y^e$, find the derivative of $g(y)$.

7) Calculate the derivative of $y = \frac{1}{\log_4(x)}$

8) A boat sails directly toward a 150-meter skyscraper that stands on the edge of a harbor. The angular size θ of the building is the angle formed by lines from the top and bottom of the building to the observer (see figure). A particular triangle that might be helpful is also given.

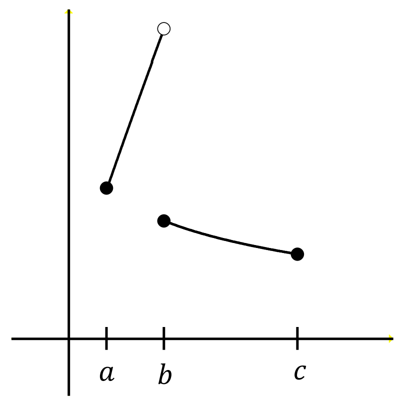




What is the rate of change of the angular size $\frac{d\theta}{dx}$ when the boat is $x = 500m$ from the building?

9) The area of a circle increases at a rate of $1cm^2/s$. How fast is the radius changing when the radius is $2cm$?

10) Use the graph below to identify the points (if any) on the interval $[a, b]$ at which the function has an absolute maximum value or an absolute minimum value.

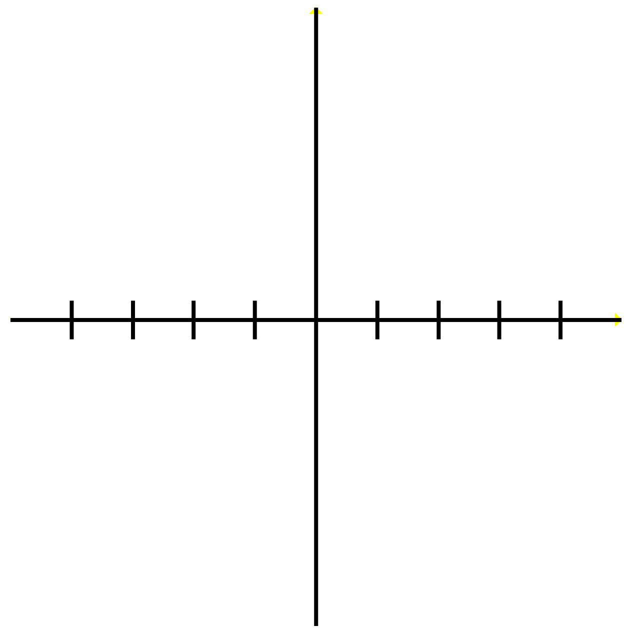


11) Find the derivative of $f(x) = \sin^{-1}(2x)$

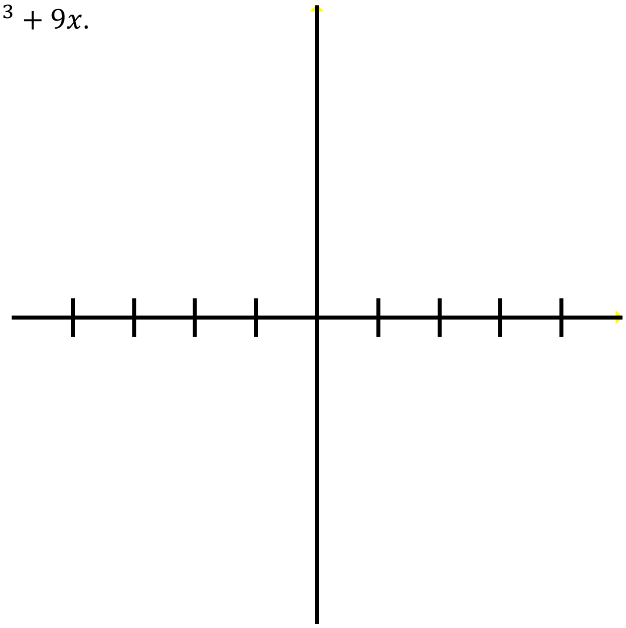
12) Graph the function below, paying particular attention to the critical values and the end behavior.

(On this problem you need not calculate the location of the inflection point(s) precisely)

$$y = \frac{x}{x^2 + 1}$$

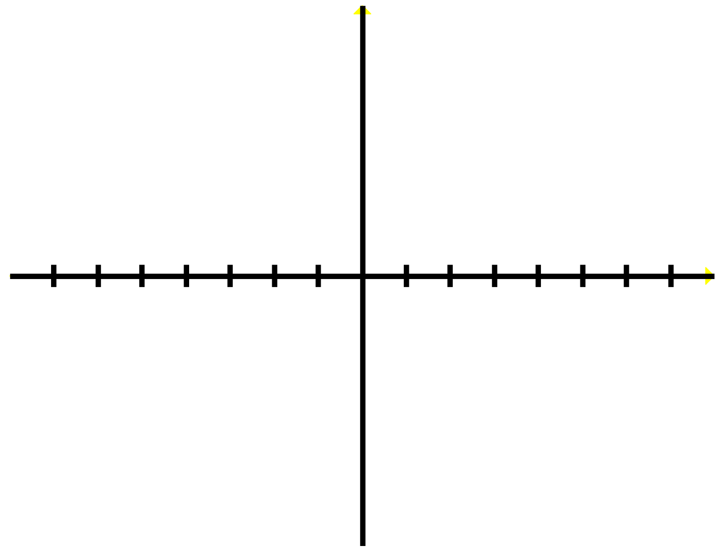


13) Graph the function $y = -x^3 + 9x$.



14) Graph the function $y = x + 2\cos(x)$ on $[-2\pi, 2\pi]$.

(On this problem you need not calculate the location of the inflection point(s) precisely)



15) Find positive numbers x and y satisfying the equation $xy = 12$ such that the sum $2x + y$ is as small as possible.

16) Evaluate the limit below.

$$\lim_{x \to \pi} \frac{\cos(x) + 1}{(x - \pi)^2}$$