Virtual Review – The Meaning of Derivatives
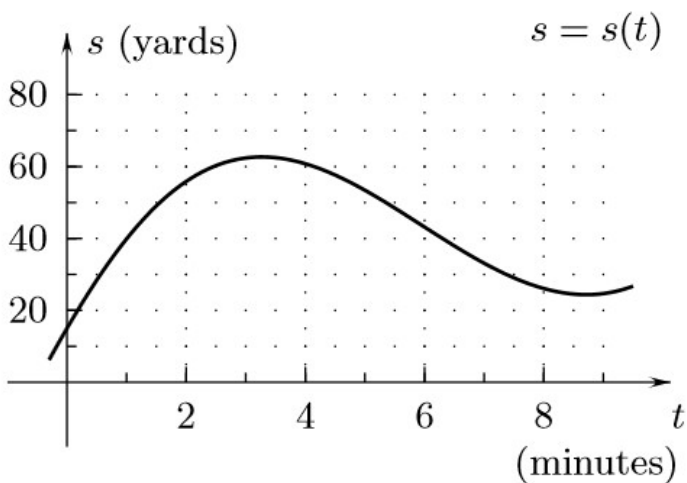
Name_____

1. Given $f(3)=-1$ and $f'(3)=2$, find the equation, at $x=3$, for the

tangent line: _____

normal line: _____

2. The graph of an object's position $s(t)$ as a function of time is below. Approximate the velocity (the derivative of position) at the following t values.

$$s = s(t)$$

(a) $t=3$

(b) $t=6$

(c) $t=1$

3. A spaceship approaches a far-off planet. At time x minutes after its retrorockets fire, its distance from the surface of the planet is given by $f(x) = x^2 - 8x + 18$.

(a) Find the average rate of change of $f(x)$ with respect to x from $x = 5$ to $x = 6$. What are the units of this rate of change?

(b) Find the rate of change at $x = 5$.

(c) When is the distance from the surface of the planet at a minimum? What does this tell you about the derivative at that time?
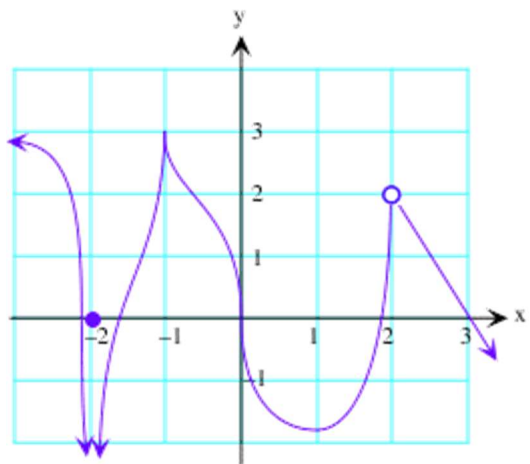
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4. Use the definition of a derivative to find $f'(x)$ if $f(x) = \dfrac{4}{3x-5}$.

5. (a) Find the derivative of $g(x) = \sqrt{5x+1}$ at $g(3)$.

(b) Write the equation of the normal line for part (a).

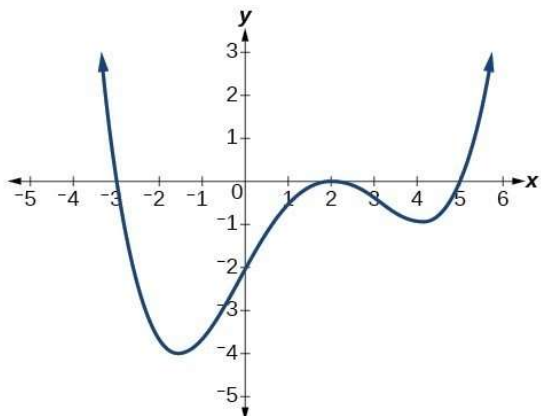6. Use the graph of $k(x)$ below for the following:

(a) Describe where and why $k(x)$ is not differentiable.

(b) List where $k(x)$ is discontinuous and give the types at each location.
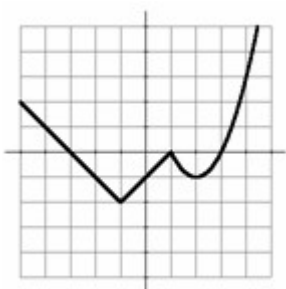
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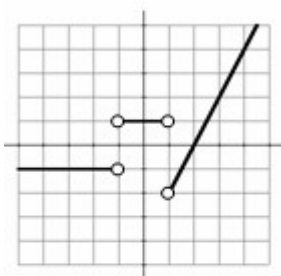7. Use the graph of $h(x)$ below to complete the table.

Condition	Domain Interval or Value
$h'(x)<0$	
$h'(x)=0$	
$h'(x)>0$	
$h''(x)<0$	
$h''(x)=0$	
$h''(x)>0$	

8. Below, in no particular order, are the graphs of $f(x)$, $f'(x)$ and $f''(x)$. Decide which graph goes with which function and name it appropriately.

Name of Graph: Name of Graph: Name of Graph:

9. Find the average rate of change of $f(x)=\sec x$ on the interval $\left[\dfrac{\pi}{4},\dfrac{5\pi}{6}\right]$.

10. Suppose that the line tangent to the graph of $y=f(x)$ at $x=2$ passes through the points $(-5,4)$ and $(2,3)$.

(a) Find $f(-5)$

(b) Find $f'(-5)$

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11. The following table shows the relationship between pressure and volume of hydrogen gas at 0^oC.

Pressure (atm)	1	2	3	4	5	6
Volume (L)	21	17	15	12	6	3

(a) Find the average rate of change of volume with respect to pressure for the interval [3,4]. **Include units.**

(b) Estimate the instantaneous rate of change at $P = 3$. **Include units.**

12. Suppose $g(x)=3x-1$ is the equation of the tangent line to the graph of $y=f(x)$ at $a=-1$. What is …

(a) $f(-1)$?

(b) $f'(-1)$?

13. The cost C (in dollars) of building a house A square feet in area is given by the function $C = f(A)$. **Include units on all answers.**

(a) What is the meaning of $f(2500)=150,000$?

(b) What is the meaning of $f'(100)=1,000$?

(c) What is the meaning of $f^{-1}(200,000)=3,000$?

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For the following, identify $f(x)$ and a.

19. $\lim\limits_{h \to 0} \dfrac{(5+h)^3 - 125}{h}$
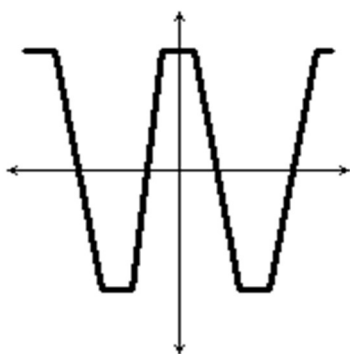
$f(x) = $ _____

$a = $ _____

20. $\lim\limits_{h \to 0} \dfrac{\cos(\pi(2+h)) - 1}{h}$

$f(x) = $ _____

$a = $ _____
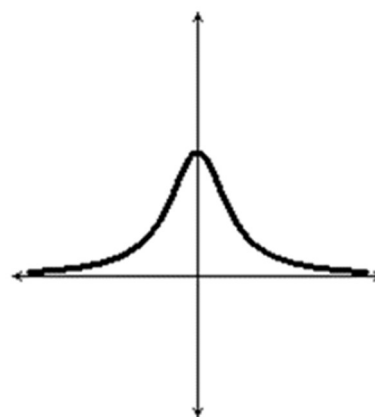
For each of the following, sketch the graph of the derivative.

21.

22.

23.

24.