

Unit 2 - Derivatives Review with answers

1. What is $\lim_{h \rightarrow 0} \frac{\cos(\frac{\pi}{3} + h) - \cos(\frac{\pi}{3})}{h}$?

- a) 0 b) $-\frac{1}{2}$ c) $\frac{1}{2}$
 d) $\frac{\sqrt{3}}{2}$ e) $-\frac{\sqrt{3}}{2}$

2. $\lim_{h \rightarrow 0} \frac{e^{x+h} - e^x}{h}$ is

- a) 1 b) 0 c) e d) e^x
 e) undefined

3. The functions f and g are differentiable and have the values shown in the table.

If $A = \begin{pmatrix} f \\ g \end{pmatrix}$ then $A'(2) =$

- a) $\frac{23}{25}$ b) $-\frac{23}{4}$
 c) $\frac{23}{4}$ d) -7
 e) $-\frac{23}{25}$

x	f	f'	g	g'
0	5	1	-7	$\frac{1}{4}$
2	8	3	-5	1
4	14	9	-3	4
6	26	27	-1	16

4. The functions f and g are differentiable and have the values shown in the table.

If $A = \sqrt{g(x)}$ then $A'(-2) =$

- a) $\frac{9}{8}$
 b) impossible
 c) $\frac{3}{2}$
 d) $\frac{4}{9}$
 e) 6

x	f	f'	g	g'
-8	4	3	-2	6
-6	10	12	0	9
-2	16	9	36	18
2	30	15	52	24

5. If $f(4) = 7$ and $f'(4) = 5$, then $f(4.097)$ is approximately _____.

- a) 7.902 b) 7.749 c) 7.485
 d) 6.932 e) 6.851

6. The position of an object is given by $s = t^2 - 3t + 8$. What is its average velocity for $3 \leq t \leq 5$?

- a) 4 b) 3.333 c) 5
 d) -5 e) 0.2

7. Given the position function $s = t^3 - 2t + 5$, what is the instantaneous rate of change at $t = 3$?

- a) $3t^2 - 2$ b) $3t^2$ c) 27
 d) 25 e) 30

8. If $f(x) = \sin(2x) \cos x$, then $f'(\frac{\pi}{3}) =$

- a) $\sqrt{3} + 1$ b) $\frac{5}{4}$ c) $\frac{\pi^2}{3} - 1$
 d) $-\frac{5}{4}$ e) $\frac{\pi}{3}$

9. Differentiate: $\frac{1 + \sin x}{1 - \sin x}$

- a) -1 b) $-2 \sec x$ c) $2 \sec x$
 d) $\frac{-2}{(1 - \sin x)^2}$ e) $\frac{2 \cos x}{(1 - \sin x)^2}$

10. If $y = \ln \sqrt{\frac{1-x}{1+x}}$, then $\frac{dy}{dx} =$
- a) $\frac{1}{1-x^2}$ b) $\frac{1}{1+x^2}$ c) $\frac{-1}{1+x^2}$
d) $\frac{-1}{1-x^2}$ e) 0
11. Assume $f(7) = 0$, $f'(7) = 14$, $g(7) = 1$, and $g'(7) = \frac{1}{7}$. Find $h'(7)$ given $h(x) = \frac{f(x)}{g(x)}$.
- a) -14 b) -2 c) 14 d) $\frac{49}{2}$ e) 98
12. Find the derivative of $9x^2 f(x)$.
- a) $9x^2 f'(x)$ b) $9x [xf(x) + 2f'(x)]$
c) $18x f'(x)$ d) $9x [xf'(x) + 2f(x)]$
e) $3x^3 + [f'(x)]^2$
13. Find an equation for the tangent line to the graph of $f(x) = \sqrt{x-7}$ at the point where $x = 16$.
- a) $x - 6y = -2$ b) $6x - y = 2$
c) $x + 6y = 2$ d) $x - 6y = 2$
e) $6x + y = -2$
14. The graph of $f(x) = \frac{-5x^2}{7+x^2}$ has a horizontal tangent at $y =$
- a) -5 b) 5 c) $\sqrt{7}$ d) $-\sqrt{7}$ e) 0
15. If $f(x) = x^2 e^x$ find a point where the tangent is horizontal.
- a) (0, 1) b) $(0, e^2)$ c) $(-2, \frac{4}{e^2})$
d) (0, -2) e) $(-2, 4e^2)$
16. If $f(x) = (x-5)^{2/3} + 1$, then the x -value of a vertical tangent is
- a) -5 b) 0 c) 1 d) 5 e) $\sqrt[3]{5}$
17. Given a function is defined by $f(x) = \sqrt{x+4}$, for what value(s) of x does the function have one or more vertical tangents?
- a) 0 only b) 4 only c) -4 only
d) 0 and 4 e) 0 and -4
18. The points on the graph $y - 3 = \sqrt{16 - 9x^2}$ where vertical tangents exist are
- a) (0, 7) and (0, -7)
b) $(-\frac{4}{3}, 3)$ and $(\frac{4}{3}, 3)$
c) $(-\frac{3}{4}, \frac{1}{3})$ and $(\frac{3}{4}, \frac{1}{3})$
d) $(\frac{16}{3}, 3)$ and $(-\frac{16}{9}, 3)$
e) $(-\frac{4}{3}, -3)$ and $(\frac{4}{3}, -3)$
19. If $y = 8 \sin 2x \cos 2x$, then $\frac{d^2 y}{dx^2} =$
- a) $-128 \sin 2x \cos 2x$ b) $128 \sin 6x$
c) $64 \sin 4x$ d) $32 \sin 2x \cos 2x$
e) $8 \sin 2x \cos 4x$

20. Find the derivative of $y = \sqrt[3]{x^2 + x}$.

a) $\frac{1}{3}(x^2 + x)^{-2/3}(2x + 1)$

b) $\frac{2}{3}(x^2 + x)^{-2/3}(2x - 1)$

c) $\frac{3}{2}(x^2 + x)^{2/3}(2x + 1)$

d) $\frac{x}{3}(x + 1)^{-2/3}(2x + 1)$

e) $\frac{1}{3}(x^2 + x)^{2/3}(2x + 1)$

21. Find $\frac{dy}{dx}$ for $y = x^3\sqrt{2x+1}$

a) $\frac{x^2(7x+3)}{\sqrt{2x+1}}$ b) $\frac{3x^2}{2\sqrt{2x+1}}$ c) $\frac{8x^3+3x^2}{2\sqrt{2x^4+x^3}}$

d) $\frac{8x+3}{\sqrt{2x+1}}$ e) $\frac{6x^3+3}{\sqrt{2x+1}}$

22. Find the derivative: $s(t) = \sec \sqrt{t}$

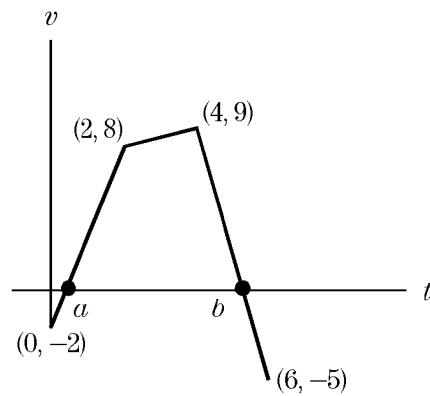
a) $\tan^2 \sqrt{t}$ b) $\frac{\sec \sqrt{t} \cdot \tan \sqrt{t}}{2\sqrt{t}}$

c) $\sec \frac{1}{2\sqrt{t}} \cdot \tan \frac{1}{2\sqrt{t}}$ d) $\sec \sqrt{t} \cdot \tan \sqrt{t}$

e) $\frac{\csc \sqrt{t}}{\sqrt{t}}$

23. The graph shows the velocity of an object that is moving along a straight line for t on $[0, 6]$.

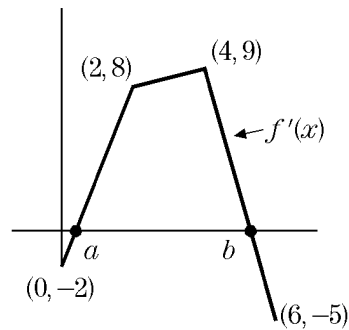
At what time(s) t does the object reverse direction?



- a) 2 and 4 b) a and b c) 4 only
 d) 5 only e) a only

24. The graph shows the velocity of an object that is moving along a straight line for t on $[0, 6]$.

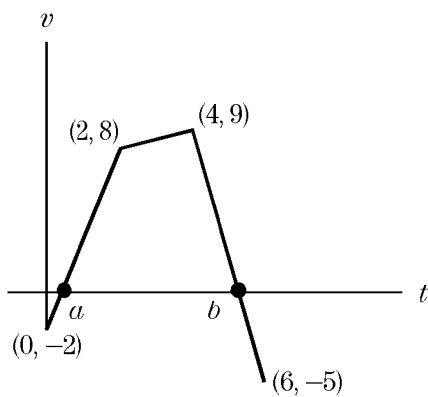
When is the speed of the object the least?



- a) at $t = 0$ b) at $t = 6$
 c) at $t = a$ and $t = b$ d) at $t = 2$
 e) at $t = -5$

25. The graph shows the velocity of an object that is moving along a straight line for t on $[0, 6]$.

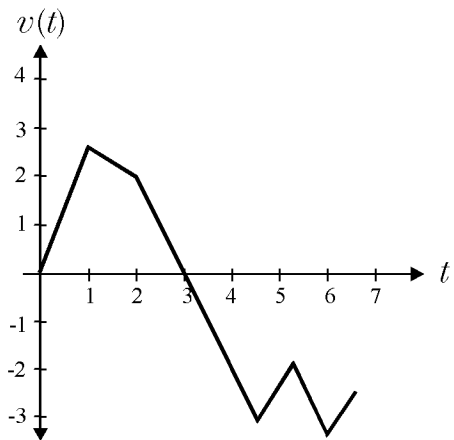
The object is furthest to the right when $t = \underline{\hspace{2cm}}$.



- a) 0 b) b c) a d) 6 e) 4

26. A mouse is running through a straight pipe. The velocity, $v(t)$, of the mouse is given at time t for $0 \leq t \leq 7$.

According to the graph, what is the *first* interval over which the acceleration is negative?



- a) $0 < t < 1$ b) $1 < t < 2$ c) $2 < t < 4$
d) $0 < t < 3$ e) $3 < t < 7$

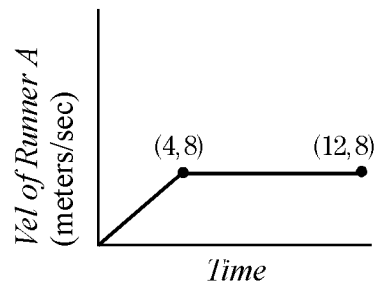
27. An particle starts at time $t = 0$ and moves along the x -axis so that its position at any time $t \geq 0$ is $x(t) = t^3 - 6t^2 + 9t + 12$. During what time intervals is the particle moving to the left?

- a) $0 < t < 1$ b) $1 < t < 4$ c) $1 < t < 3$
d) $t < 3$ e) $t > 3$

28. A moving particle travels along the x -axis so that its position at any time is $x(t) = t^3 - 12t^2 + 36t - 20$ on the interval $[0, 7]$. How many times does the particle change direction?

- a) 1 b) 2 c) 3 d) 4 e) 0

- 29.



Two runners, A and B , run on a straight track for $0 \leq t \leq 10$ seconds. The graph shown consists of two line segments and shows the velocity, in meters per second, of runner A . The velocity, in meters per second, of runner B is given by $V(t) = \frac{20t}{3t + 2}$.

- a) Find the velocity of runner A and runner B at time $t = 3$ seconds. Indicate units of measure.
b) Find the acceleration of runner A and runner B at time $t = 3$ seconds. Indicate units of measure.
c) Find the total distance run by runner A and runner B over the time interval $0 \leq t \leq 12$ seconds. Indicate units of measure.

Unit 2 - Derivatives Review with answers 9/24/2013

1.
Answer: e
2.
Answer: d
3.
Answer: e
4.
Answer: c
5.
Answer: c
6.
Answer: c
7.
Answer: d
8.
Answer: d
9.
Answer: e
10.
Answer: d
11.
Answer: c
12.
Answer: d
13.
Answer: a
14.
Answer: e
15.
Answer: c
16.
Answer: d
17.
Answer: c
18.
Answer: b
19.
Answer: a
20.
Answer: a

21.
Answer: a
22.
Answer: b
23.
Answer: b
24.
Answer: c
25.
Answer: b
26.
Answer: b
27.
Answer: c
28.
Answer: b
29.
Answer: A:6 m/sec, B:5.455 m/sec, A:2
m/sec², B:0.331 m/sec², A:80 m,
B:66.914 m