1) $f'(x) = -x^3 + 2x = 0$

$-x(x^2 + 2) = 0$

$x = 0 \quad x = \pm\sqrt{2}$

$+ \; -\sqrt{2} \; - \; 0 \; + \; \sqrt{2} \; - \quad f'(x)$

max min max

rel max $(-\sqrt{2}, 0)$ and $(\sqrt{2}, 0)$ rel min $(0, -1)$

x-int $(-\sqrt{2}, 0)$ $(\sqrt{2}, 0)$

y-int: $(0, -1)$

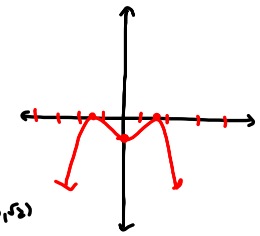
dec $(-\sqrt{2}, 0) \cup (\sqrt{2}, \infty)$ inc $(-\infty, -\sqrt{2}) \cup (0, \sqrt{2})$

$f''(x) = -3x^2 + 2 = 0$

$x = \pm\sqrt{6}/3$

$- \; -\sqrt{6}/3 \; + \; \sqrt{6}/3 \; -$

inflection: $(-\sqrt{6}/3, -4/9)$ $(\sqrt{6}/3, -4/9)$



Dec 5-7:48 AM

2) $y = (x-2)^2(x+1)$

$y' = 2(x-2)(x+1) + 1(x-2)^2$

$x = -1 \quad x = 2$

$+ \; 0 \; - \; 2 \; + \quad y'$

rel min $(2, 0)$

rel max $(0, 4)$

$y'' =$

$- \; 1 \; +$

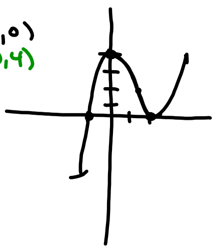
x int: $(2, 0)$ $(-1, 0)$

y int $(0, 4)$

$(1, 2)$ inflection

$(-\infty, 1)$ concave down

$(1, \infty)$ concave up

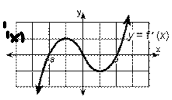


Dec 5-7:58 AM

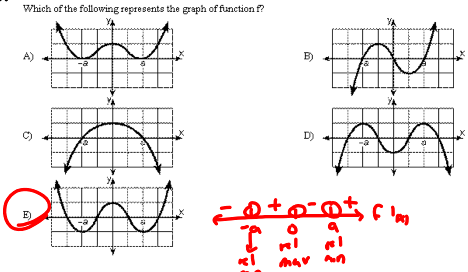
1) The graph of the derivative of function f is shown below.

$- \; -a \; + \; 0 \; - \; a \; + \quad f'(x)$

min max min



Which of the following represents the graph of function f?



$- \; -a \; + \; 0 \; - \; a \; + \quad f'(x)$

rel min rel max rel min

2) For what values of x is the graph of $f(x) = x^3 + 6x^2 + 9x + 3$ decreasing?

A

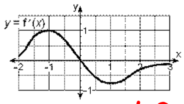
$3x^2 + 12 + 9 = 0$

$x^2 + 4x + 3 = 0$

$+ \; -3 \; - \; -1 \; +$

Dec 5-7:46 AM

3) The graph of the derivative of function f is shown below.



Where on the interval [-2,3] is function f decreasing?

$+ \; 0 \; -$

inc 0 dec

E (0,3]

Dec 5-7:47 AM

7799 - 1 - Page 2

4) The graph of $f(x) = 8x^5 - 5x^4$ will have how many points of inflection?

A) one B) two C) three D) four E) none

$f'(x) = 40x^4 - 20x^3$

$f''(x) = 160x^3 - 60x^2$

$60x^2(10x - 1)$

$- \; 0 \; - \; 0 \; + \quad f''(x)$

$0 \quad \frac{1}{10}$

5) If $f''(x) = x^2(x + 2)(x - 3)$, then the graph of function f has a point of inflection for what value(s) of x?

A) -2, only B) 3, only C) 3 and 0, only

D) -2 and 3, only E) 0, -2, and 3

$x^2 = 0 \quad x + 2 = 0 \quad x - 3 = 0$

$+ \; 0 \; - \; 0 \; - \; 0 \; +$

$-2 \quad 0 \quad 3$

inf none in

must check # line for change of signs!

Slopes are 0

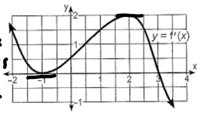
6) The graph of f′, the derivative of function f, is shown below.

$- \; 0 \; + \; 0 \; - \quad f''(x)$

$-1 \quad 2$

Slopes

horizontal tangent lines here



At what value(s) of x does function f have a point of inflection?

A) $x = 3$ and $x = -1$, only B) $x = 2$, only C) $x = -1$ and $x = 2$, only

D) $x = -1, x = 2, x = 3$, only E) $x = 0$, only

Dec 5-7:43 AM

7) Determine the interval where the given function is concaved upwards, concaved downwards, and the coordinates of all inflection points.

x only

$f(x) = 3x^5 - 5x^3 + 1$

$f'(x) = 15x^4 - 15x^2$

$f''(x) = 60x^3 - 30x$

$30x(2x^2 - 1) = 0$

$x = 0 \quad x = \pm\sqrt{2}/2$

$- \; 0 \; + \; 0 \; - \; 0 \; + \quad f''(x)$

$-\frac{\sqrt{2}}{2} \quad 0 \quad \frac{\sqrt{2}}{2}$

Concave up $(-\frac{\sqrt{2}}{2}, 0) \cup (\frac{\sqrt{2}}{2}, \infty)$

Concave d: $(-\infty, -\frac{\sqrt{2}}{2})(0, \frac{\sqrt{2}}{2})$

Inf: $x = -\sqrt{2}/2$ and $x = 0$ $x = \sqrt{2}/2$

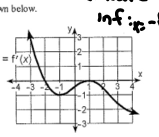
8) The graph of the derivative of function f is shown below.

$+ \; 0 \; - \; 0 \; - \quad f'(x)$

$-2 \quad 1$

inc to dec

rel max



At what value of x does function f have a relative maximum?

A) 3 B) -1 C) -2 D) 1 E) 0

Dec 5-7:45 AM

The function $s(t) = t^3 - 18t^2 + 60t - 1$ describes the motion of a particle moving along a line. → starts at 0 $t=0$

a) Find the velocity function of the particle at any time t;
b) Identify the time intervals when the particle is moving in a positive direction; $[0,2) \cup (10,\infty)$
c) Identify the time intervals when the particle is moving in a negative direction; and $(2,10)$
d) Identify the times when the particle changes its direction. $t=2$ and $t=10$
e) Identify where object speeds up and slows down

$v(t) = 3t^2 - 36t + 60$

$t^2 - 12t + 20 = 0$ $\quad (t-10)(t-2) = 0$

$v(t)$: $+$ ⓪ $-$ ⓪ $+$ (2, 10)

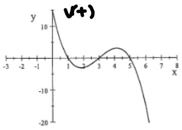
$a(t)$: $-$ ⓪ $+$ (6)

speed up → $(2,6) \cup (10,\infty)$ same sign $v(t)$ and $a(t)$

Slow down / Speed dec: $(0,2) \cup (6,10)$

Dec 5-7:45 AM

Let the graph of a velocity function (x = time, y = feet/sec) be given below:
Assuming the x-intercepts for the following graph is at $x = 1, 3,$ and 5.



$v(t)$: $+$ ⓪ $-$ ⓪ $+$ ⓪ $-$ (1, 3, 5)

$a(t)$: $-$ ⓪ $+$ ⓪ $-$ (2, 4) → slopes

a. What is the initial velocity (when time=0)? → 15 (y-value of graph at $t=0$)
b. Explain how velocity function can be negative sometimes. → $(1,3) \cup (5,\infty)$ goes down
c. Estimate the inflection point(s) for the distance function. $t=2, t=4$
d. Estimate the maximum and minimum for the distance function. rel max: $t=1, t=5$ rel min $t=3$
e. Find the interval(s) where the acceleration is negative. → $(0,2) \cup (4,\infty)$ → slopes of vt dec.

Dec 5-7:46 AM