name - scuba moose

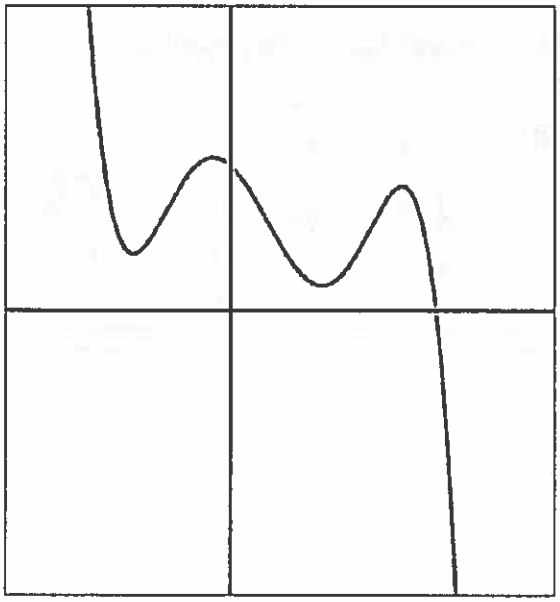
Time allotment–approximately 2 minutes per question
NO graphing calculator is allowed for these problems.
***Note**--On the AP Calculus exam (next year), you will have 30 non-calc questions and 60 minutes to complete.*

1) The function *g* is defined as $g(t) = 2(t-3)^2 - 8$. What is the sum of the zeroes of function g?
Demonstrate your work $0 = 2(t-3)^2 - 8$

a) 5 b) 0 c) 10 d) 6

$0 = 2(t-3)^2 - 8$
$8 = 2(t-3)^2$
$4 = (t-3)^2$
$2 = t-3$ or $-2 = t-3$
$5 = t$ $1 = t$

sum of 1 & 5 is 6



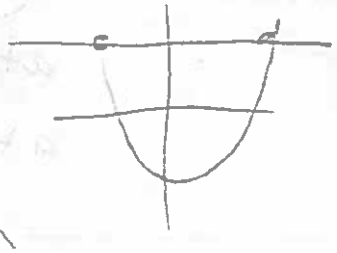
The graph of *g*

2) The graph of *g* is shown above. Which of the following could be the equation of function *g*? Explain
a) $y = 0.3x^5 + 0.7x^4 + x^3 - 2x^2 - x + 2$
b) $y = -0.3x^5 + 0.7x^4 + x^3 - 2x^2 - x + 2$
c) $y = -0.3x^5 + 0.7x^4 + x^3 - 2x^2 - x - 2$
d) $y = -0.3x^3 - 2x^2 - x + 2$

3) The function *h* is defined as $h(x) = x^2 - 5x - 8$. The function *p* is defined as $p(x) = 6$. The two functions intersect at two points. Find the sum of the x-coordinates where *a(x)* and *p(x)* intersect. Explain

a) 4 b) 9 c) -3 d) 5

$h(x) = p(x)$
$x^2 - 5x - 8 = 6$
$x^2 - 5x - 14 = 0$
$(x-7)(x+2) = 0$
$x = 7$; $x = -2$
$7 + -2 = 5$



Use for questions 4 and 5:

At time t=0 a ball is thrown into the air. The height of the ball can be modeled with the equation $h(t) = -5(t-2)^2 + 45$ [where *h(t)*, the height of the ball, is measured in meters and *t*, the time after the ball is thrown, is measured in seconds...and ground is established to be *h(t)=0*].

4. How high was the ball off the ground when initially thrown? *Demonstrate Work*

a) 4 b) 5 c) 25 d) 65

$t=0$

$h(0) = -5(0-2)^2 + 45$

$= -5(4) + 45$

$= -20 + 45$

25

5. The ball was also thrown forward with an initial velocity of 12 meters per second. How far did the ball land from where it was thrown? Demonstrate Work

$h(t) = -5(t-2)^2 + 45$

PEMA

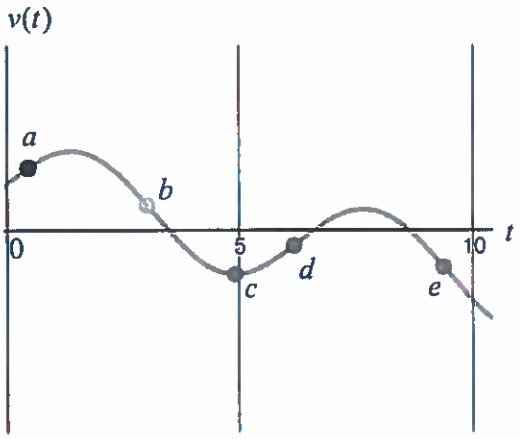
$0 = -5(t-2)^2 + 45$

$-45 = -5(t-2)^2$

$9 = (t-2)^2$

$3 = t-2$ or $t-2 = -3$

$5 = t$ $t = -1$

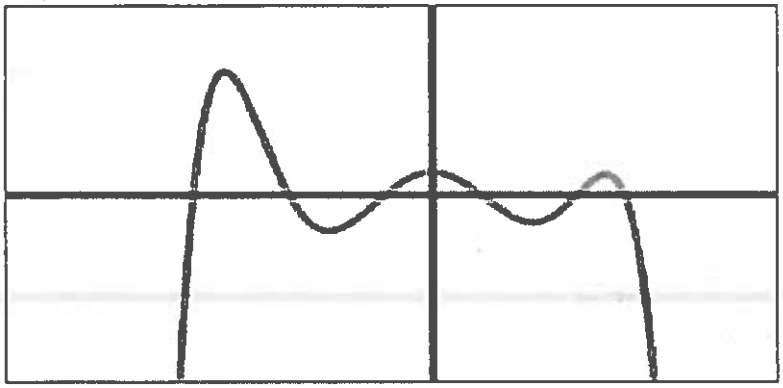


5) The function *v(t)* shows the velocity of a particle as it moves along a straight line (positive velocity is movement to the right and negative velocity is movement to the left). At what two points is the particle's speed decreasing? *Justify*

a) *a* and *b* b) *b* and *d* c) *d* and *e* d) *a* and *e*

at point b, the velocity is positive ... but is decreasing

at point d, the velocity is negative ... but becoming less negative



The graph of g

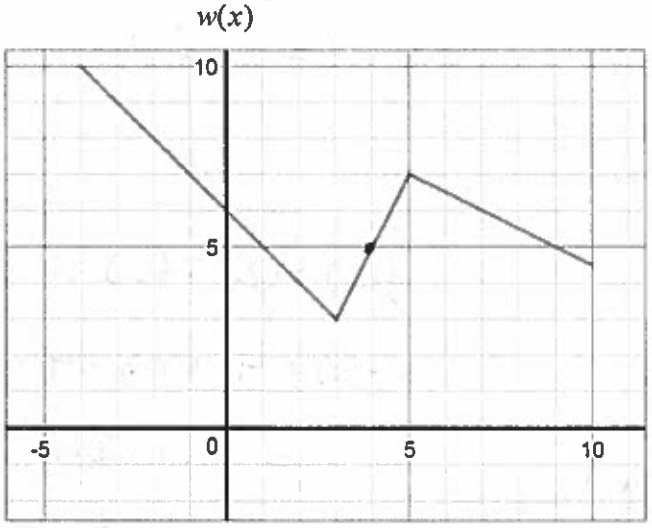
6) The graph of g is shown above. Which of the following could be the equation of function g? Explain

a) $y = x^6 - x^5 - 30x^4 - 10x^3 + 209x^2 + 21x + 10$

b) $y = -x^6 + x^5 + 30x^4 + 10x^3 - 209x^2 - 21x + 10$

c) $y = -x^6 + x^5 + 30x^4 + 10x^3 - 209x^2 - 21x - 10$

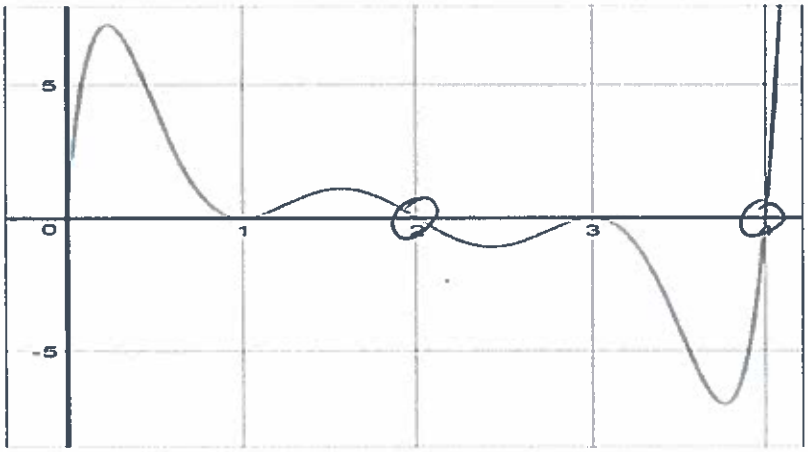
d) $y = x^6 + x^5 + 30x^4 + 10x^3 - 209x^2 - 21x - 10$



$b(x) = (x-3)^2 + 4$

7) Compute the value of $b(w(4))$ → $b(5) = (5-3)^2 + 4 = 8$

a) 5 b) 6 c) 7 d) 8



8) The function v(t) for $0 \le t$ models the velocity of a particle on a number line as a function of time [*v(t)* is measured in meters per second and *t* is measured in seconds]. Positive velocity indicates movement to the right and negative velocity indicates movement to the left. The graph for the function v(t) is provided above. At what time(s) does the particle change direction? Justify

a) 0.3, 1.5, 2.5 and 3.7 b) 1 and 3 c) 2 and 4 4) does not change direction

change direction when the velocity changes sign

(+ → −)

or

(− → +)

happens when t = 2 & 4

9) Function *f is given as* $f(x) = x^2 - 6x - 7$ and function *g* is given as the function $g(x) = x^2 + bx - 14$.

g(2) has the same value as the y-coordinate for the vertex for function *f*.

What is the value of b?

Demonstrate work

$f(x) = x^2 - 6x - 7$

$f(x) = (x-7)(x+1)$

7, 0 −1, 0

vertex is @ $x = \frac{7+-1}{2} = 3$

vertex coordinate

(3, −16)

$g(2) = (2)^2 + b(2) - 14 = -16$

$g(2) = 4 + 2b - 14 = -16$

$= -10 + 2b = -16$

$2b = -6$

$b = -3$

must factor!

10) In the interval $t \geq 0$, the velocity of a particle moving along the x-axis is given as $v(t) = t^3 - 5t^2 - 4t + 20$
In what time interval(s) is the particle moving to the left on the x-axis? Justify

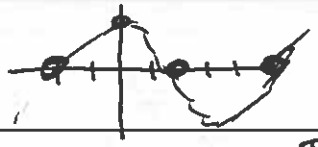
factors of 20: 1, 2, 4, 5, 10, 20

$v(t) = (t-2)(t^2-3t-10)$

$v(t) = (t-2)(t-5)(t+2)$

(2,0) (5,0) (-2,0) & (0,20)

graph



1) 1 -5 -4 20
1 -4 -8
1 -4 -9 |12

2) 1 -5 -4 20
2 -6 -20
1 -3 -10 |0

The times the particle is moving left are between 2 and 5 time units (or $2 < t < 5$)

11) In the interval $t \geq 0$, the position of a particle moving along the x-axis is given as $p(t) = t^3 - 12t^2 + 44t - 48$
The particle passes by the origin at time t=6. At what other time(s) does the particle pass by the origin? Justify

$p(t) = 0$ at origin

$0 = t^3 - 12t^2 + 44t - 48$

$0 = (t-6)(t^2-6t+8)$

$0 = (t-6)(t-4)(t-2)$

$t = 4$ and $t = 2$ will have positions of 0 (i.e. ... go by the origin)

Use 6 in synthetic

6] 1 -12 44 -48
6 -36 48
1 -6 8 |0

12) For selected times, the velocity (*v(t)*) and the acceleration *(a(t))* for an inchworm crawling on a wire are provided.

Time	*Velocity (v(t))*	*Acceleration (a(t))*
2	*4*	*-2*
5	*-3*	*1*
6	*5*	*2*
9	*-11*	*0*
11	*-3*	*-0.5*
14	*4*	*-0.5*
15	*0*	*-4*
16	*18*	*-1*

Provide the times the inchworm is ~~stopped~~. Explain

~~stopped~~ $t = 15$ since velocity is 0.

☆ Meant to write:
provide the times the inchworm is slowing down:
$t = 2$, $t = 5$, $t = 11$, $t = 14$, $t = 16$

13) Factor $f(t) = 5t^2 + 11t - 12$

$f(t) = (5t - 4)(t + 3)$

14) Function *g* function has a zero at x = 3. The function is given as $g(x) = 2x^4 - 11x^3 + 18x + bx + 3$.
What is the value of *b*?

3| 2 −11 18 b 3

6 −15 9 27+3b

2 −5 3 9+b | 0

$30 + 3b = 0$

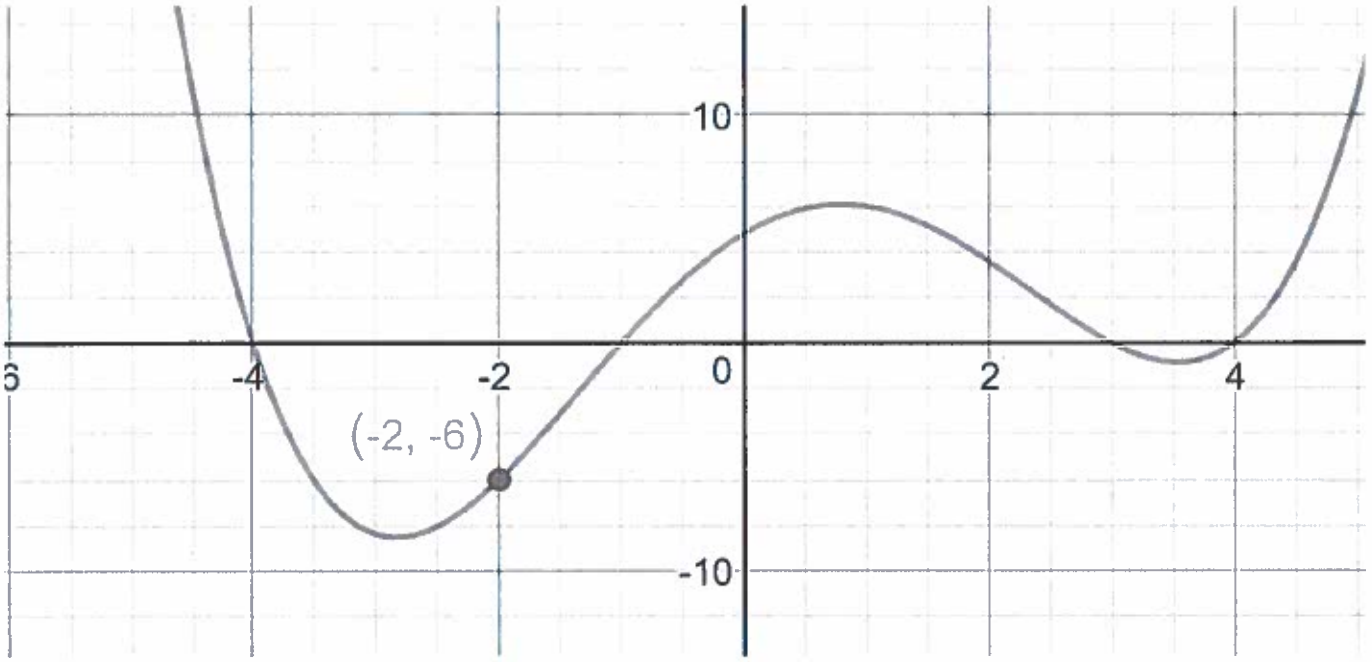
$3b = -30$

$b = -10$

−10

15) All of the important points for function h are seen. Function *h* is a polynomial.

Write the equation of function h



$h(x) = a(x+4)(x-3)(x-4)(x+1)$ $a = \frac{+6}{60}$

$-6 = a(-2+4)(-2-3)(-2-4)(-2+1)$

$-6 = a(2)(-5)(-6)(-1)$

$-6 = -60a$

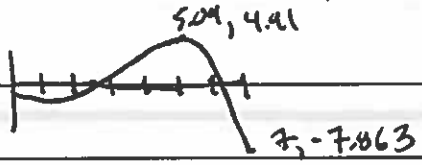
$a = \frac{+1}{10}$

$h(x) = \frac{1}{10}(x+4)(x+1)(x-3)(x-4)$

Graphing calculator is allowed and expected for these problems.
Time allotment-approximately 3 minutes per question
****Note** Next year in AP Calc, The AP test will have 15 Calculator questions and 45 minutes to complete**

51) The velocity of a particle is modeled by the equation $v(t) = 0.5t^{2.4} - 1.8^t$. At what time was the particles speed the greatest in the time interval of $0 \le t \le 7$?

$|-7.863| \quad |7| \quad |4.91|$



at time 7, the speed is greatest.

52) The velocity of a bug is modeled with the function v, with $v(t) = t^{2.7} - 2.5^t + 2.2$ being measure in meters per second and t being measured in seconds. In the first 5 seconds, how many times did this bug change direction? Explain

1 time at the time $t = 4.424$, the velocity changes sign (positive to negative)

53) A squirrel is walking along a telephone wire and the squirrel's position during the first 2 minute ($0 \le t \le 2$) is modeled with the equation w(t), where $w(t) = 9t^3 - 23.914t^2 + 10.065t$ is measured in feet and t is measured in minutes. A positive position indicates a position to the east of where the bug started on the wire and a negative position indicates a position to the west of where the squirrel initially started. At what time (in minutes) is the squirrel the furthest from where it started? Explain

since it is position - the point farthest from the horizontal axis or the greatest $|w(t)|$ would be the furthest from where it started this happened at time $t = 1.527$ min

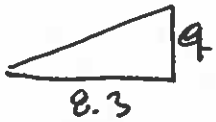
54) A caterpillar is observed crawling along a wire. For the first 4.5 minutesof observation ($0 \le t \le 4.5$), the caterpillar's velocity can approximated closely with the equation $c(t) = -0.7t^{3.4} + 2.9^t$, where $c(t)$ is measured in inches per minute and t is measured in minutes. With a negative velocity being movement to the left and a positive velocity being movement to the right. At what time did the caterpillar achieve its maximum speed? Justify

time $t = 3.711(9)$ seconds the greatest speed was achieved when the velocity was -8.451 inches/minute

Use for questions 55 and 56

A ball was hit in the air. The function to model the height of the ball is given as $h(t) = -4.9t^2 + 9t + 2.1$. The horizontal position of the ball is given as $f(t) = 8.3t$. Where t is given in seconds, $h(t)$ represent meters above the ground and $f(t)$ represents meters horizontally away from the position the ball was hit.

55) What was the speed and the angle in which the ball was hit? Demonstrate



Speed = 12.242(9) meters/second
angle of release = 47.317°

56) How far did the ball travel horizontally before the ball hit the ground? Explain

in air for
$0 = -4.9t^2 + 9t + 2.1$
$t = 2.046$

horizontal distance = $8.3(2.046)$
$= 16.981(9)$ meters