Which function has:

i) zero at $x = 3$ → num $x-3$

ii) horizontal asymptote $y = 4$ → same deg in numerator & denom + Coeff in numerator of 4.

iii) vertical asymptote at $x = -5$ → deno $x+5$

iv) hole at $x = 1$ → $x-1$ on top & Bottom

A.

$$f(x) = \frac{4(x-3)(x-1)}{(x+5)(x-1)}$$

B.

$$f(x) = \cancel{\frac{4(x-3)}{(x+5)(x-1)}}$$

C.

$$f(x) = \cancel{\frac{4(x-3)(x-1)}{(x+5)^2(x-1)}}$$

D.

$$f(x) = \frac{(x-3)(x-1)}{(x+5)(x-1)}$$

E. The function cannot be determined.

Question 52 of 54

A particle is moving on a straight line with an initial velocity of 6 ft/sec and an acceleration of

$v(0) = 6$

$$a(t) = 4t - 3,$$

where t is time in seconds and $a(t)$ is in ft/sec^2. What is its velocity after 3 seconds? $v(3) = ?$

- ● 15 ft/sec
- ○ 3 ft/sec
- ○ 9 ft/sec
- ○ −3 ft/sec
- ○ 21 ft/sec
- ○ −6 ft/sec

$$a(t) = \frac{dV}{dt} = 4t - 3$$

$$dV = 4t - 3\,dt$$

$$\int dV = \int 4t - 3\,dt$$

$$V = \frac{4t^2}{2} - 3t + C$$

$V(0) = 6$

$$6 = 0 - 0 + C$$

$$C = 6$$

$$V = 2t^2 - 3t + 6$$

$$V(3) = 2(3)^2 - 3(3) + 6 = 15$$

Question 16 of 54

A particle moving on a straight line has an acceleration of

$$a(t) = 2t,$$

$\to v(0) = 10$ $\quad \to p(0) = 0$ $\quad \to p(3) = ?$

where t is time in seconds and $a(t)$ is in ft/sec^2. Its initial velocity is 10 ft/sec, and its initial position is 0. What is its position after 3 seconds?

- ○ 16 ft
- ● 39 ft
- ○ 63 ft
- ○ 33 ft
- ○ 66 ft
- ○ 19 ft

$\frac{dV}{dt} = 2t$

$dV = 2t\,dt$

$\int dV = \int 2t\,dt$

$V = t^2 + C$

$V(0) = 10$

$10 = 0 + C$

$C = 10$

$v = t^2 + 10$

$V = \frac{dp}{dt} = t^2 + 10$

$dp = t^2 + 10\,dt$

$\int dp = \int t^2 + 10\,dt$

$p = \frac{t^3}{3} + 10t + C$

$p(0) = 0$

$0 = 0 + 0 + C$

$C = 0$

$p = \frac{t^3}{3} + 10t$

$p(3) = \frac{3^{\cancel{3}\,2}}{\cancel{3}} + 30 = 39$

A company's marketing dept has determined that if their product is sold at the price of p dollars per unit then they can sell $q = 2000 - 50p$ units. What is the max possible revenue from selling this product?

$R = pq = p(2000 - 50p) = 2000p - 50p^2$

$R' = 2000 - 100p = 0$

$20\cancel{00} = 1\cancel{00}p$

$20 = p$

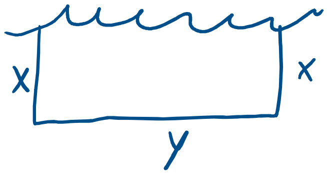
$R(p) = p(2000 - 50p)$

$R(20) = 20(2000 - 50(20))$

A rectangular field will be bordered on one side by a straight river (no fence on this side) and on the other three sides by fence. If the field must be $8000\,m^2$ and the fencing material costs \$17 per m of fence, what is the min cost of the fencing materials.

$A = xy = 8000 \Leftrightarrow y = 8000x^{-1}$

$P = 2x + y$



$P = 2x + y$

$C = \$17 \cdot P = \$17(2x+y) = 34x + 17\cancel{y}$

$C = 34x + 17(8000)x^{-1}$

$C' = 34 - 17(8000)x^{-2} = 0$

$34 - \frac{17(8000)}{x^2} = 0$

$\frac{34}{1} = \frac{17(8000)}{x^2}$

$34x^2 = 17(8000)$

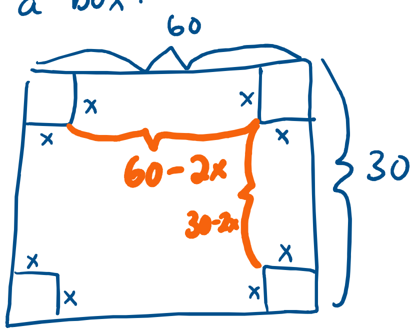
$2 \cdot \cancel{17} x^2 = \cancel{17}(8000)$

$x^2 = 4000 \rightarrow x = 20$

$C = 34x + \frac{17(8000)}{x}$

$\boxed{C(20) = 34(20) + \frac{17(8000)}{20}}$

You start with a 60 cm by 30 cm rectangular piece of aluminum. By cutting a square from each of the corners and folding up the flaps, a box with no top is formed. What is the max volume of such a box?



$V = x\underbrace{(60-2x)(30-2x)}$

	60	$-2x$
30	1800	$-60x$
$-2x$	$-120x$	$+4x^2$

$= x(1800 - 60x - 120x + 4x^2)$

$= x(1800 - 180x + 4x^2)$

$= 1800x - 180x^2 + 4x^3$

$V' = 1800 - 360x + 12x^2 = 0$

$= 12[150 - 30x + x^2] = 0$

$x = \frac{-(-30) \pm \sqrt{(-30)^2 - 4(150)}}{2(1)}$

$= \frac{30 \pm 10\sqrt{3}}{2}$

$150 = 2 \cdot 3 \cdot 5^2$

150

10 15

2 5 3 5

150

2 $3 \cdot 5^2$

3 $2 \cdot 5^2$

5 $2 \cdot 3 \cdot 5$

6 50

10 15

$l = 30 - 2x$

$w = 60 - 2x$

$x = \frac{30 - 10\sqrt{3}}{2} \approx 6.34$

$\cancel{x \approx \frac{30 + 10\sqrt{3}}{2}} \approx 23.66$

$$x = \frac{30-10\sqrt{3}}{2} \approx 6.34 \qquad \cancel{x \approx \frac{30+10\sqrt{3}}{2} \approx 23.66}$$

$$V = x(60-2x)(30-2x)$$

$$= \frac{30-10\sqrt{3}}{2}\left[60-(30-10\sqrt{3})\right]\left[30-(30-10\sqrt{3})\right]$$

$$= \frac{30-10\sqrt{3}}{2}\left[30+10\sqrt{3}\right]\left[10\sqrt{3}\right]$$