

12.5 each

Show work for credit.

1. The total number of people killed in alcohol-related crashes can be modeled by the function

$$f(x) = -0.3718x^4 + 21.9933x^3 - 395.6523x^2 + 1880.2042x + 21524.7647$$

where x is the number of years from 1982.

① a.) State the degree of the polynomial.

④ = even

① b.) State the leading coefficient.

-0.3718 < 0

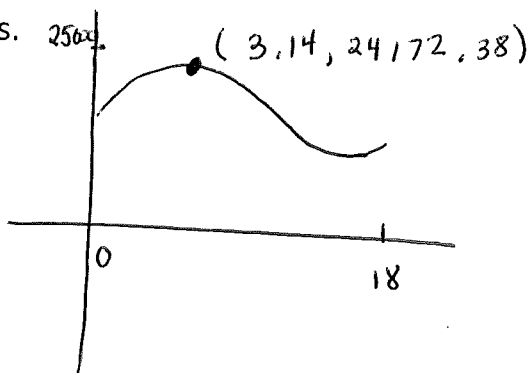
① c.) How should the end behavior or tails look?

↙ ↓

② d.) How many total solutions to $f(x) = 0$ are there?

④

③ e.) Sketch a graph of $f(x)$ from 1982 to 2000. Be sure to indicate your scale on the axes.



② f.) In what year did the maximum number of fatalities occur?

3.14 years after 1982

①985

② g.) Is it likely that this model can be used to estimate the total number of fatalities for long after 2000?

No because the right tail plunges down to

$-\infty$.

2.) A firm has total weekly revenue for its product given by
 $R(x) = 2000x + 30x^2 - 0.3x^3$, where x is the number of units sold.

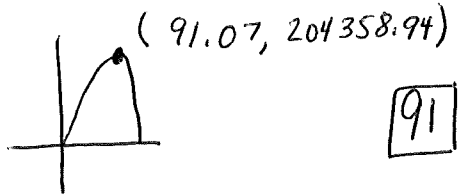
② a.) Because x represents the number of units sold, what restrictions should be placed on x in the context of the problem? $x \geq 0$

② b.) What restrictions should be placed on $R(x)$? $R \geq 0$

② c.) If 60 units are sold, what revenue will be generated?

$$R(60) = 2000(60) + 30(60)^2 - 0.3(60)^3 = 163200$$

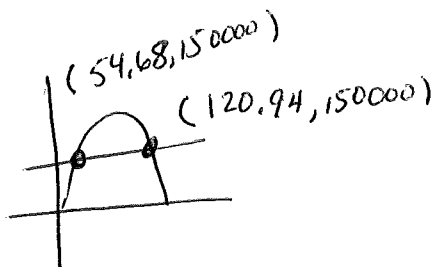
② d.) How many units must be sold to have a maximum revenue?



② e.) How many units must be sold to have a revenue of \$150,000?

$$150,000 = 2000x + 30x^2 - 0.3x^3$$

$y_2 \qquad \qquad \qquad y_1$



54.68 and 120.94
55 and 121

3.) Make a complete sketch of the graph $f(x) = (x+5)(x-1)^2(x+1)^3 = 1x^6 + \dots$

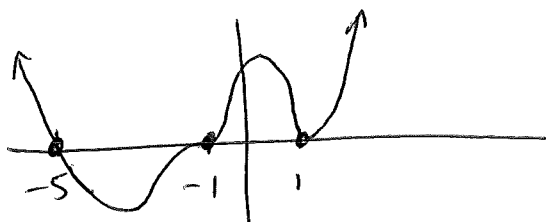
12.5

xint: $0 = (x+5)(x-1)^2(x+1)^3$

$x+5=0$ $(x-1)^2=0$ $(x+1)^3=0$

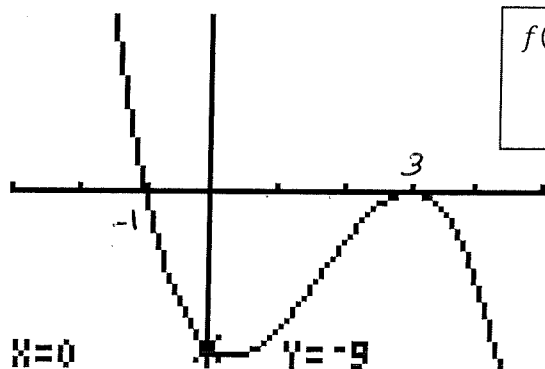
$x=-5$ $x=1$ $x=-1$
 mult=1 mult=2 mult=3

↑ ↑
 $n=6 = \text{even}$
 $a=1 > 0$



12.5

4. Find the equation of the function whose graph is given below.



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

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12.5

Supposed to be a plus!

5.) Solve $4x^3 + 8x^2 - 36x - 72 = 0$.

$$4(x^3 + 2x^2 - 9x - 18) = 0$$

$$4[x^2(x+2) - 9(x+2)] = 0$$

$$4[(x^2-9)(x+2)] = 0$$

$$4(x+3)(x-3)(x+2) = 0$$

$$x = -3, 3, -2$$

12.5

6.) Solve $2x^4 - 162 = 0$.

$$2(x^4 - 81) = 0$$

$$2(x^2+9)(x^2-9) = 0$$

$$2(x^2+9)(x+3)(x-3) = 0$$

$$x^2+9=0$$

$$x = \pm 3i$$

$$x = \pm 3$$

7.) Given $f(x) = \frac{7}{x-4}$

4) a.) State any vertical asymptotes.

$$x-4 \neq 0$$

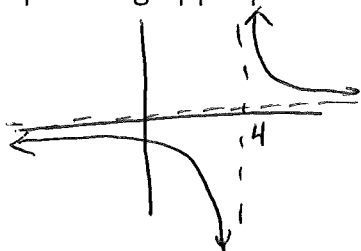
$$x \neq 4$$

4) b.) State any horizontal asymptotes.

$$m > n$$

$$y \neq 0$$

4) c.) Sketch the graph using appropriate scale.



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

4) a.) State any vertical asymptotes.

$$x+3 \neq 0$$

$$x-5 \neq 0$$

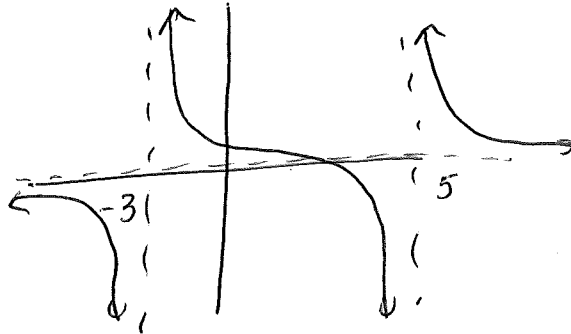
$$x \neq -3, 5$$

4) b.) State any horizontal asymptotes.

$$m > n$$

$$y \neq 0$$

4) c.) Sketch the graph using appropriate scale.



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