

Exam 1

① $f(x) = \frac{2x^3 - 250}{x^2 - 2x - 15}$. Domain?

$$x^2 - 2x - 15 = 0$$

$$(x-5)(x+3) = 0 \quad x = 5; x = -3$$

Domain: $(-\infty, -3) \cup (-3, 5) \cup (5, \infty)$

② $f(x) = \frac{x+4}{x-4}$. Domain?

$$x+4 \geq 0 \quad x \geq -4$$

$$x \neq 4$$

③ $f(x) = \begin{cases} 5x & \text{if } x < 0 \\ 3 & \text{if } 0 \leq x \leq 3 \\ x^2 & \text{if } x > 3 \end{cases}$ $[-4, 4) \cup (4, \infty)$

$f(0) = 3$

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④ $f(x) = \frac{(x^2-4)(x+1)}{x^2+3}$

Find A.R.O.C. of f on $[-3, 1]$

$$\text{A.R.O.C.} = \frac{f(1) - f(-3)}{1 - (-3)} = \frac{\frac{(1^2-4)(1+1)}{1^2+3} - \frac{((-3)^2-4)(-3+1)}{(-3)^2+3}}{1+3}$$

$$= \frac{\frac{-3 \cdot 2}{4} - \frac{5 \cdot (-2)}{12}}{4} = \frac{-\frac{3}{2} + \frac{5}{6}}{4} = \frac{-\frac{9}{6} + \frac{5}{6}}{4} = \frac{-\frac{4}{6}}{4} = \frac{-\frac{2}{3}}{4} = \frac{-1}{6}$$

⑤ $f(x) = -2x^2 + 5x - 8$. $b=5; a=-2$

Vertex: $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$

$$= \left(-\frac{5}{2(-2)}, f\left(-\frac{5}{2(-2)}\right)\right) = \left(\frac{5}{4}, f\left(\frac{5}{4}\right)\right)$$

$$= \left(\frac{5}{4}, -2\left(\frac{5}{4}\right)^2 + 5\left(\frac{5}{4}\right) - 8\right) = \left(\frac{5}{4}, -2 \cdot \frac{25}{16} + \frac{25}{4} - 8\right) = \left(\frac{5}{4}, -\frac{50}{16} + \frac{100}{16} - \frac{128}{16}\right) = \left(\frac{5}{4}, \frac{-78}{16}\right)$$

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⑥ Range of $f(x) = -2(x+3)^2 - 6$

Vertex: $(-3, -6)$

$(-\infty, -6]$

⑦ $H(t) = -16t^2 + 96t + 112$

Max height? $t = \frac{-96}{2(-16)} = \frac{-96}{-32} = 3$

$$-16 \cdot 9 + 96 \cdot 3 + 112 = 256$$

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⑧

A.R.O.C. $x=1; x=6$

$$\frac{f(6) - f(1)}{6 - 1} = \frac{5 - 5}{5} = 0$$

⑨ $f(x) = \frac{x^2-1}{x^3+9x^2+14x}$ H.A.

deg top = 2 < deg bottom 3

$y=0$

$$\frac{x^2}{x^3} = \frac{1}{x}$$

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⑩ $f(x) = \frac{x^2-1}{x^3+9x^2+14x}$ V.A.

$$= \frac{(x-1)(x+1)}{x(x^2+9x+14)} = \frac{(x-1)(x+1)}{x(x+2)(x+7)}$$

$x=0; x=-2; x=-7$

⑪ $x=1$ V.A.

$\frac{(x+3)(x-2)}{3(x-1)}$ y-intercept: $(0, 2)$

x-intercept: $x=2$

⑫ $A(t) = P\left(1 + \frac{r}{n}\right)^{nt}$

$P = \$3000; r = 0.03; n = 4; t = 10$

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⑬ Calculate the initial deposit of an account that is worth $\$14,472.74$ interest 5.5%; monthly 5 years

$$A = \$14,472.74$$

$$14,472.74 = P\left(1 + \frac{0.055}{12}\right)^{12 \cdot 5}$$

⑭ $f(x) = e^x$ is vertically stretched by a factor of 2, reflected across the y-axis, shifted up 4 units.

new function $g(x)$?

$$g(x) = 2e^{-x} + 4$$

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