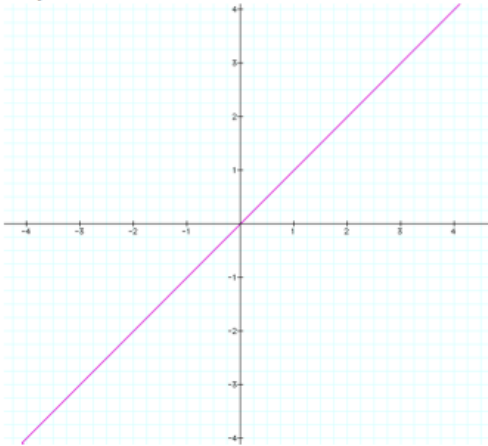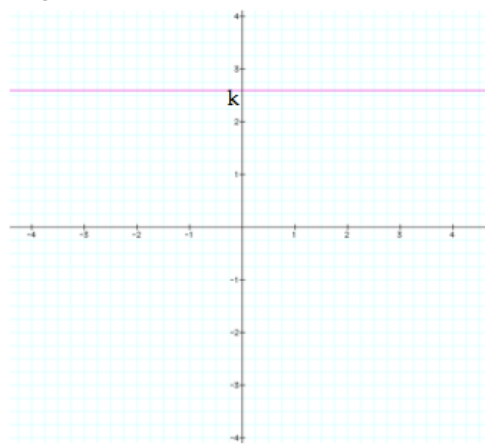# AP Calculus - Test of Basic Facts - Solutions

Each of the following questions are to be completed without the aid of a calculator, textbook or notebook.
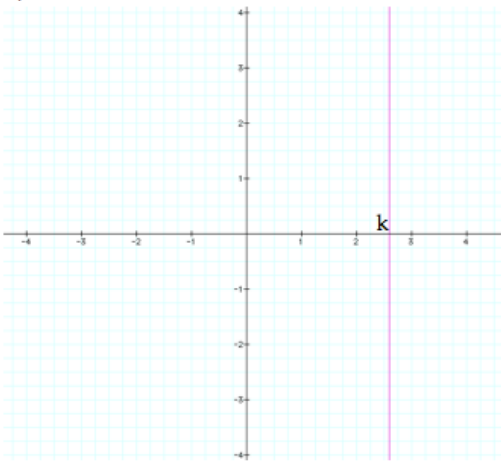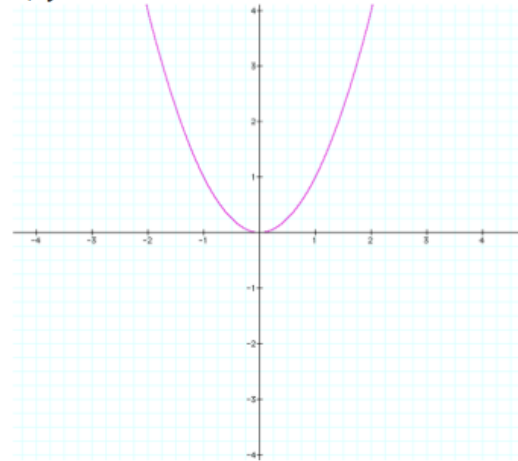
Sketch the following graphs on the axes provided:
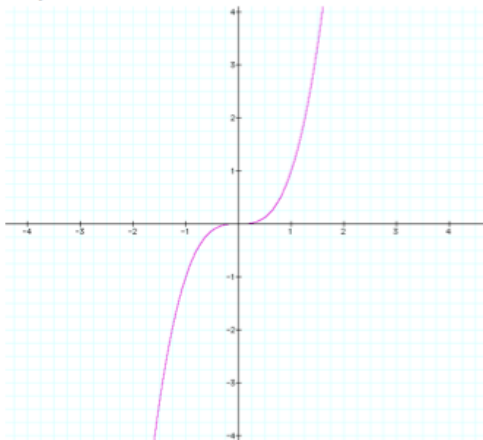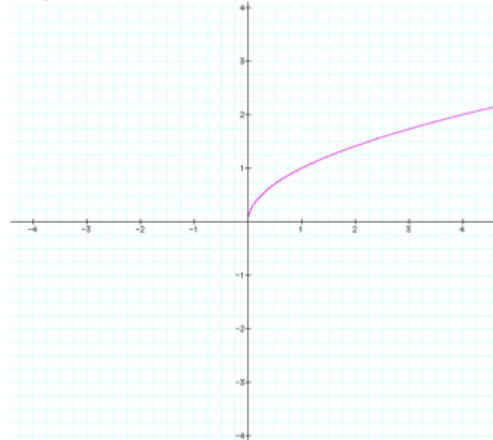
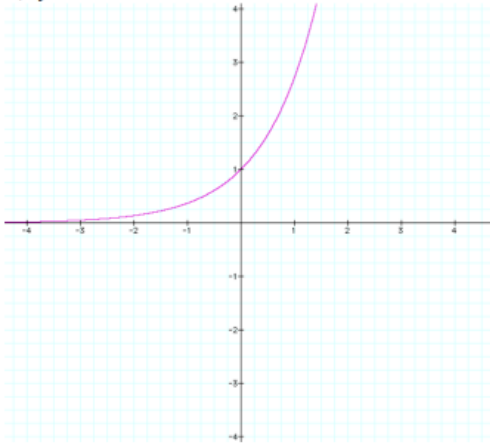1) $y = x$

2) $y = k$

3) $x = k$
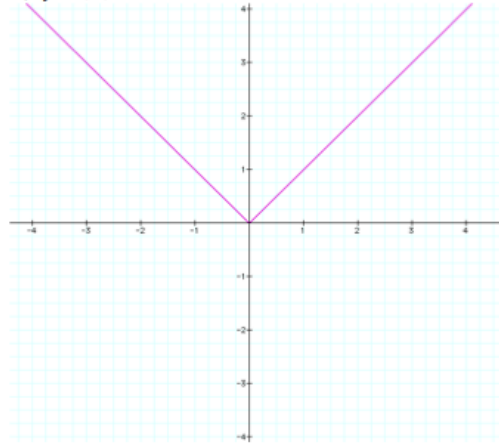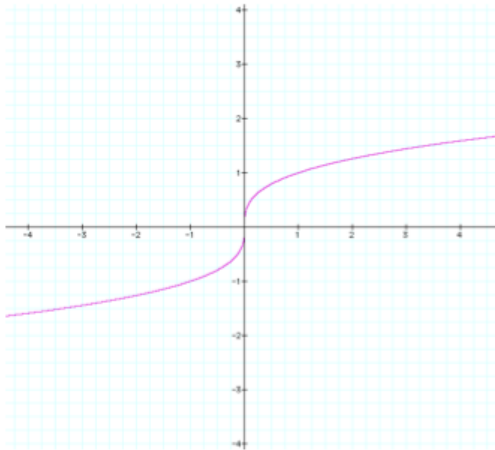

4) $y = x^2$

5) $y = x^3$

6) $y = \sqrt{x}$

7) $y = e^x$

8) $y = |x|$

9) $y = \sqrt[3]{x}$

10) $y = \|x\|$ (greatest integer function)

11) $y = \sin x$
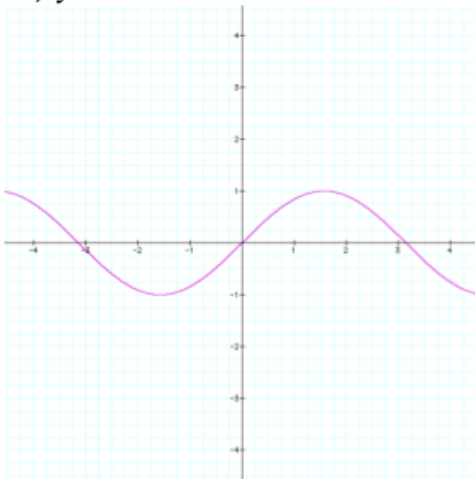
12) $y = \cos x$
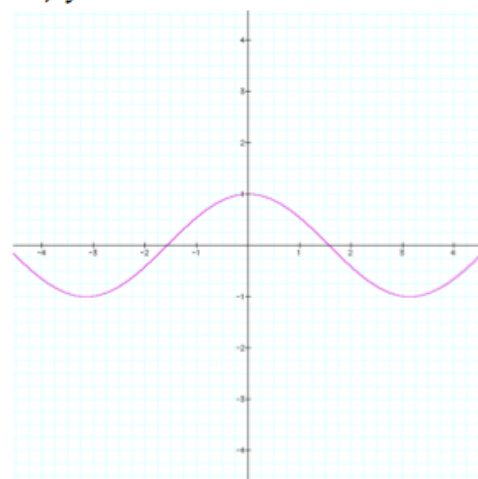
13) $y = \tan x$
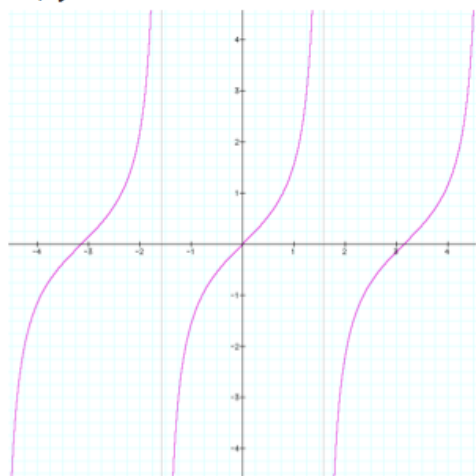
14) $y = \ln x$
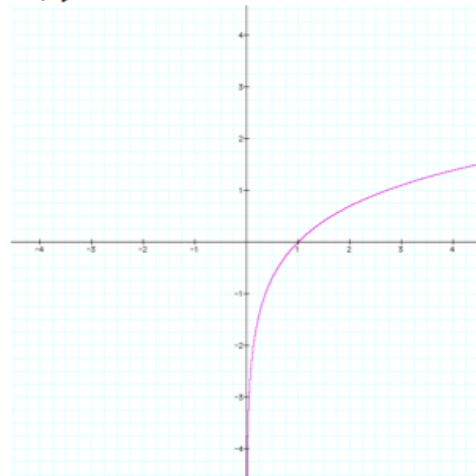
21) Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

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State the formula for each of the following:

15) Area of a triangle: $A = \frac{1}{2}b \cdot h$

16) Area of a parallelogram: $A = b \cdot h$

17) Area of a rectangle: $A = l \cdot w$

18) Area of a square: $A = s^2$

19) Area of a Circle: $A = \pi r^2$

20) Area of a trapezoid: $A = \left(\dfrac{b_1 + b_2}{2}\right)h$

20) Arc length: $a = r\theta$ (θ measured in radians)

21) Volume of a cone:
$$V = \tfrac{1}{3}\pi r^2 h$$

22) Volume of a pyramid
$$V = 1/3\ Bh$$

23) Volume of a sphere:
$$V = \tfrac{4}{3}\pi r^3$$

24) Surface area of a sphere:
$$A = 4\pi r^2$$

25) Volume of a cylinder:
$$V = \pi r^2 h$$

26) Surface area of a cylinder:
$$A = 2\pi r^2 + 2\pi rh$$

27) Volume of a rectangular prism:
$$V = lwh$$

28) State the pythagorean theorem:
$$a^2 + b^2 = c^2$$

29) For what kind of triangles can the Pythagorean Thm. be used: <u>right triangles.</u>

Label the lengths of the sides of the following triangles:

30)
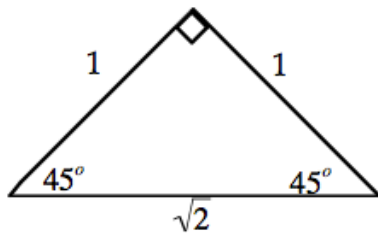
31)
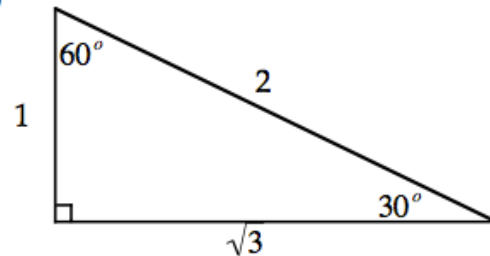
Note: this is labeling the <u>ratios</u> of the sides not the actual side lengths

32) What is the formula used to find the slope of a line? $m = \dfrac{rise}{run} = \dfrac{\Delta y}{\Delta x}$

33) What is the point slope form of the equation of a line? $(y - y_o) = m(x - x_o)$

34) How do you find the inverse of a function? <u>Switch x and y, solve for y.</u>

35) How does the graph of a function relate to the graph of the inverse of the function? <u>They are reflections of each other through the line y=x.</u>

36) How does a function relate algebraically to its inverse? $\underline{f\left(f^{-1}(x)\right) = x \text{ and } f^{-1}\left(f(x)\right) = x}$

37) One degree equals how many radians? $1° = \dfrac{\pi}{180}$

38) One radian equals how many degrees? $1\ rad = \dfrac{180}{\pi}$

39) State three forms of the pythagorean trigonometric identity (each using different trigonometric functions)

$\underline{\sin^2(\theta) + \cos^2(\theta) = 1}$ $\underline{1 + \cot^2(\theta) = \csc^2(\theta)}$ $\underline{\tan^2(\theta) + 1 = \sec^2(\theta)}$

Write each of the following in terms of $\sin\theta$ and $\cos\theta$:

41) $\tan\theta$ $\underline{\dfrac{\sin\theta}{\cos\theta}}$ 42) $\cot\theta$ $\underline{\dfrac{\cos\theta}{\sin\theta}}$

43) $\sec\theta$ $\underline{\dfrac{1}{\cos\theta}}$ 44) $\csc\theta$ $\underline{\dfrac{1}{\sin\theta}}$

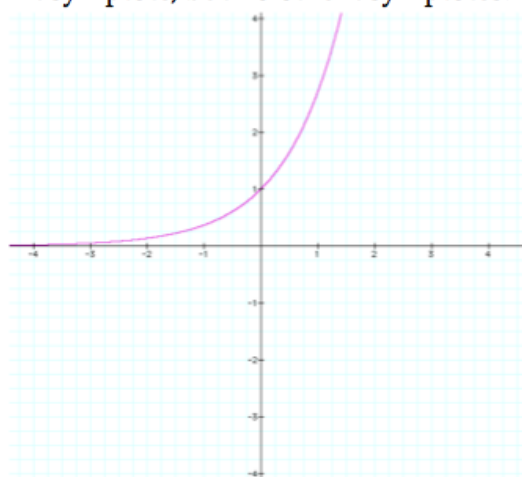45) $\sin(2\theta)$ $\underline{2\sin\theta\cos\theta}$ 46) $\cos(2\theta)$ $\underline{1 - 2\sin^2\theta}$ $= \cos^2\theta - \sin^2\theta = 2\cos^2\theta - 1$

Note: for $\cos(2\theta)$ all 3 versions are required

47) Sketch a graph that has one vertical asymptote, but no other asymptotes.
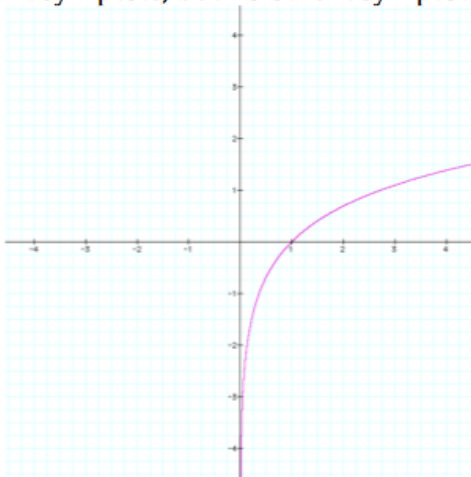
48) Sketch a graph that has one horizontal asymptote, but no other asymptotes.

Given the function $y = -a \sin b(x - c) + d$, describe the role of the following parameters:

49) the initial negative sign: <u>reflection on the x-axis.</u>

50) a: <u>vertical stretch/compression.</u>

51) b: <u>horizontal stretch/compression.</u>

52) c: <u>horizontal translation.</u>

53) d: <u>vertical translation.</u>

54) Whole numbers: <u>0,1,2,3...</u>

55) Natural numbers: <u>1,2,3...   (note: a common mistake is to forget the ...</u>

56 Real numbers: <u>rational numbers U irrational numbers</u>

(any number that is rational or irrational is real)

57) Rational numbers<u>: any number that can be written in the form p/q where p and q are integers and q ≠ 0</u>

OR Rational numbers: <u>any number that can be written as a decimal that terminates or repeats</u>

58) Irrational numbers: <u>decimals that neither terminate nor repeat</u>

59) Integers: <u>...-3,-2,-1,0,1,2,3,...</u>   (note: don't forget the ...)

60) Rewrite the power $\#^{-\frac{a}{b}}$: $\dfrac{1}{\sqrt[b]{\#^a}}$ or $\dfrac{1}{\sqrt[b]{\#}^a}$