# TMath 125

Show all your work.

Reasonable supporting work must be shown to earn credit.

1. [3] (SummationActivity #1) Expand $\displaystyle\sum_{i=1}^{4}\left(\frac{2i}{i+1}\right)$.

   (You do *not* need to compute or simplify this!)

2. [4] (Quiz1#1) Consider the shaded area trapped between the circle centered at $(0,0)$ with radius one and the x and y axis shown below. Display the shaded area as a definite integral. Make sure you write it in such a way that technology could compute your answer.
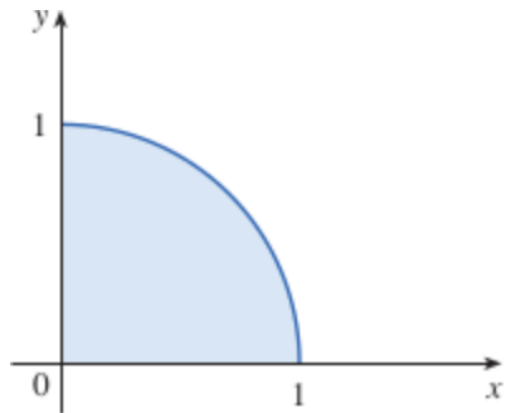
3. [6] (WebHW5-5#8 & WebHW5-3#16) Outline how you would find the following. For example, if you use substitution, identify the u and du that an be used to find an antiderivative. If you use a theorem or rule, identify which one. You do *not* need to integrate!!
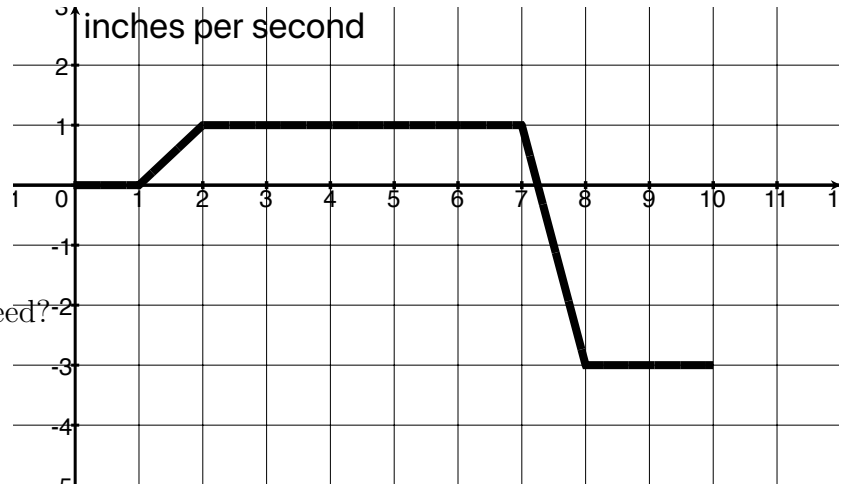
   (a) $\displaystyle\int \frac{(\arctan(x))^4}{x^2+1}\,dx$

   (b) $\displaystyle\frac{d}{dx}\left(\int_{2}^{3x+5} \frac{t}{1+t^2}\,dx\right)$

4. Let $v(t)$ be the piece-wise defined function graphed below that is comprised of straight lines. The graph of v reports the velocity (inches per second) of a bug walking along the top of wooden gate at time t. At $t = 0$, the bug is in the middle of the gate and the positive direction be movement to the right.

Let $p(x) = \int_0^x v(t)\, dt$

(a) [1] (Quiz2#1)
Estimate $v(4)$.

(b) [2] (WordProblem#12)
What is the bug's top speed?

(c) [2] (WebHW5-3#1) Find $v'(6)$.

(d) [2] (WordProblems#1) Interpret $v'(6)$ in terms of distance, velocity, or acceleration of the bug.

(e) [2] (WrittenHW5-3#4) Estimate $p(10)$.

(f) [2] (IndefinitieActivity #3) How far from the middle is the bug after 10 seconds?

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5. (WebHW6-1#3) Consider the area trapped by $f(x) = \frac{1}{5}x^3 - 3x$, and $g(x) = x$.

(a) [2] Sketch and shade the
region bounded by the curves.

(b) [4] Set up the definite integral
(but do *not* compute!)that
will find the area of the
shaded region.

(graph with x-axis from -4 to 5 and y-axis from -4 to 5)
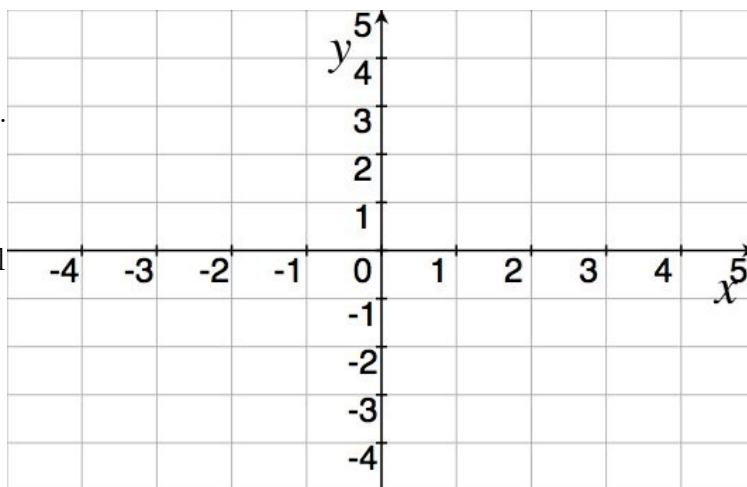
6. Each of the regions, A, B, & C bounded by the graph of f and the x axis has area 5.
Find the following:

(a) [2] (DefiniteIntegralActivity#3) $\displaystyle\int_0^2 3f(t)\, dt$
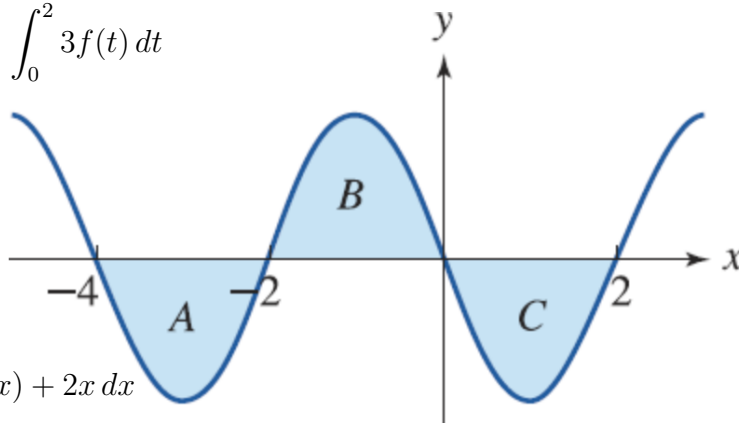
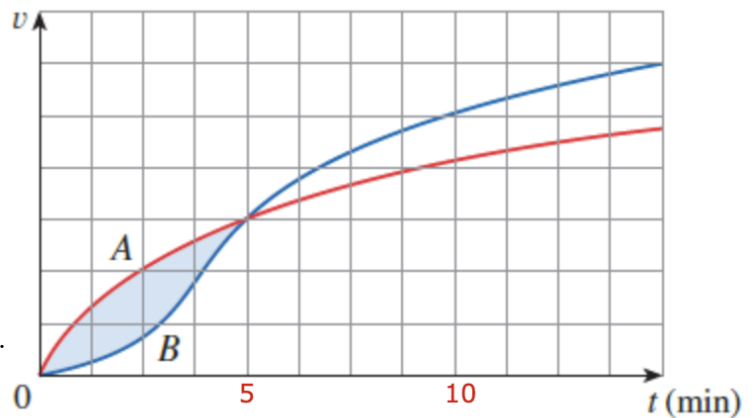(b) [4] (WebHW5-2&5-3#7) $\displaystyle\int_{-4}^2 f(x) + 2x\, dx$

7. [4] Each of the following is wrong. Explain why.

(a) $\displaystyle \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sin(x)}{\cos^2(x)}\, dx = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{u^2}\, du = -u^{-1}]_{\frac{\pi}{6}}^{\frac{\pi}{3}} = \left(-\frac{\pi}{3}\right)^{-1} - \left(-\frac{\pi}{6}^{-1}\right) = \frac{-3}{\pi} + \frac{6}{\pi} = \frac{3}{\pi}$

(b) $\displaystyle \int_{1}^{2} \frac{4}{x^3}\, dx = \int_{1}^{2} 4x^{-3}\, dx = 4(-3)x^{-4}|_1^2 = -12\cdot 2^{-4} - (-12\cdot(1)^{-4}) = -192 + 12 = 180$

8. (WebHW6-1#9) Two cars A and B start side by side and accelerate from rest. The figure shows the graphs of their velocity functions.

(a) [2] Explain the meaning of the intersection.

(b) [3] Which car is leading after 6 minutes? Justify your answer.

9. (WebHW5.5 #13) A bacterial population starts with 300 bacteria and grows at a rate of $r(t) = (450.268)e^{1.12567t}$ bacteria per hour. How many bacteria will there be after three hours?

(a) [2] How many bacteria will there be after three hours?

(b) [3] Write down a function that returns how many bacteria there are at time t.